The New Understanding Numbers

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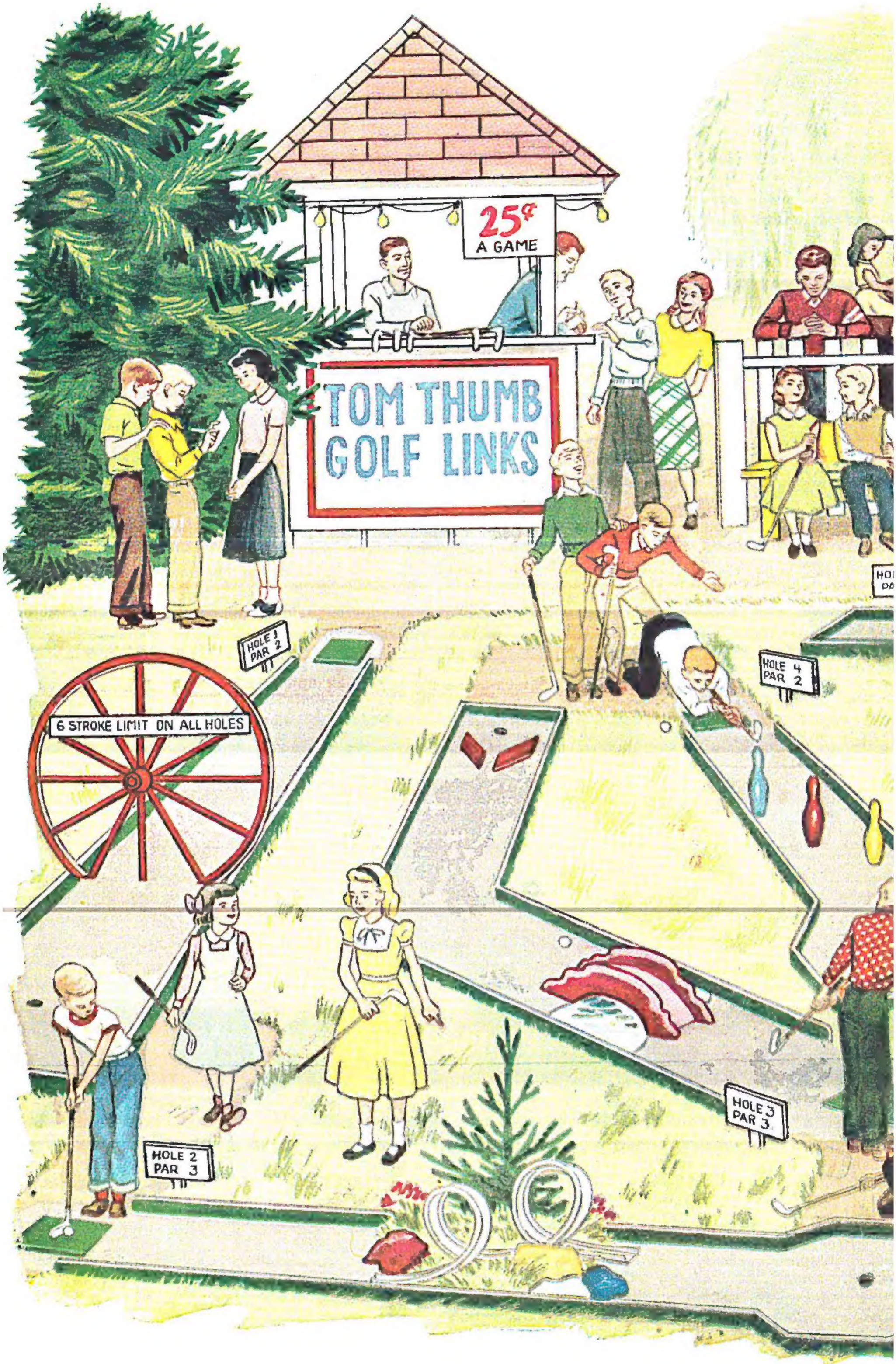
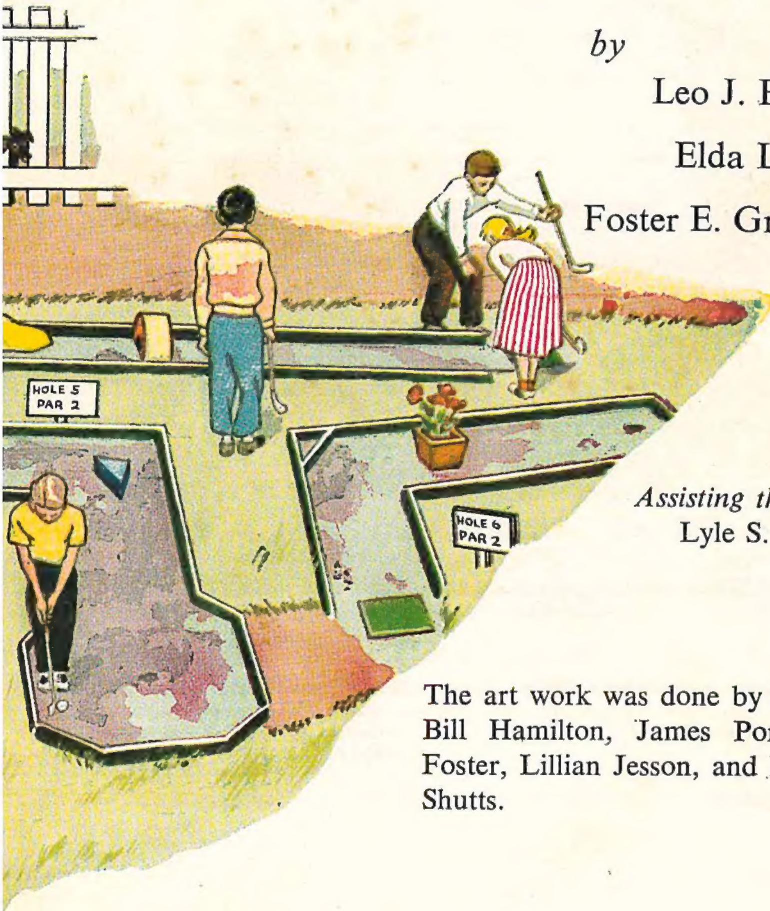

25¢
A GAME
TOM THUMB
GOLF LINKS
6 STROKE LIMIT ON ALL HOLES
HOLE 1
PAR 2
HOLE 2
PAR 3
HOLE 3
PAR 3
HOLE 4
PAR 2

The New

Understanding Numbers



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CHAPTER I

A Giant Spider Web

Air routes spread like a giant spider web over the face of the earth. What city is the center of the air routes shown on the map?

1. How many hours does it take to fly from Los Angeles to Chicago? to Nome? to Manila?

2. How much less is the time to fly from Los Angeles to Chicago than to New York?

3. How much longer does it take to fly from Los Angeles to Washington, D.C. than to Honolulu?

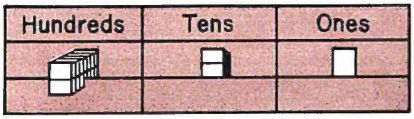
4. How much more than one day does it take to fly from Los Angeles to Tokyo?

5. How many hours less than $\frac{1}{2}$ day does it take to fly from Los Angeles to Miami?

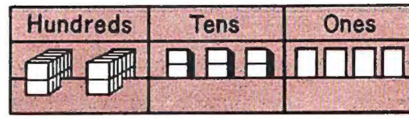
6. The air-line distance from Los Angeles to Mexico City is 1544 miles. How many hours does it take to fly this distance? How many miles is this on the average an hour?

7. It takes $20\frac{1}{2}$ hours to fly from Los Angeles to London. How many hours does it take to fly from New York to London?

★8. Why is it likely that the time for these trips will be shorter in the future?



A



B

Showing the Meaning of Place Value

We can use the charts above to show the meaning of place value in our numbers. They are called **place-value charts.**

1. How many cards do you see in **ones' pocket** in A?

2. Ten of the ones' cards are equal to a bundle of ten, or **1 ten.** You see 1 ten in **tens' pocket** in A. How many ones' cards are the same as 1 ten and 1 one?

3. Explain why 14 ones are the same as 1 ten and 4 ones.

4. Ten of the tens' bundles are equal to 1 hundreds' bundle. You see 1 hundreds' bundle in A. How many ones' cards are there in 10 tens' bundles? $10 \times 10 = ?$

You see that 1 hundred = 10 tens or 100 ones. See the hundreds' pocket.

1 hundred	**or**	**100**
1 ten	**or**	**10**
1 one	**or**	**1**
Total		**111**

5. The meaning of the number shown in A is given at the right. Explain.

6. In 111, each figure has ten times the value of the next figure to its right. Use chart A to prove this statement.

7. What is the number that is shown in B above?

8. Show that 34 is 3 tens and 4 ones, or 34 ones.

9. Prove that 230 is the same as 2 hundreds and 3 tens, or 23 tens. Why must we write a zero in ones' place?

10. In 125,706 the 1 is written in hundred-thousands' place. In what place is the 2 written? the 5? Read the number. Why can we say that 125,706 is a six-place number? What place does 0 hold in this number?

11. Why is 999 the largest possible three-place number?

The Romans Did Not Use Zero

Roman	Arabic
II	2
XX	20
CC	200

1. The box at the right shows you how the Romans wrote 2, 20, and 200. How did the Romans write 1? 10? 100?

2. Our number 20 means 2 tens and no ones. How did the Romans write the number 20? How did they write 300?

3. The 0 in 20 helps us to show the place value of the 2. What is the value of the 2 in 200? Why do we need zeros to write this number? Why did the Romans not need zeros to write the number?

4. The Roman numerals CCCIII mean 303. How many places are there in this Roman numeral? Show that the Romans did not use place value as we do. Did the Romans use zero as a place holder in their system?

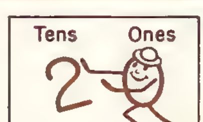
5. In the Roman system the letter M stands for 1000. Write one thousand thirty in Roman numerals and in Arabic numerals. In which number did you use zeros as place holders? In what places did you write zeros? Why?

6. In the number $6\frac{3}{10}$, the $\frac{3}{10}$ is written to the right of ones' place. The fraction has no place value. Why may we say that common fractions are an **addition** to our number system?

7. How is zero used as a place holder in these examples?

a. $\begin{array}{r} 364 \\ +236 \\ \hline 600 \end{array}$ b. $\begin{array}{r} 9731 \\ -3641 \\ \hline 6090 \end{array}$ c. $\begin{array}{r} 375 \\ \times 8 \\ \hline 3000 \end{array}$ d. $\begin{array}{r} 807 \\ 4\overline{)3228} \end{array}$

★8. Someone has said that "zero was a great invention." What do you think was meant by this statement?



The Meaning of Million and Billion

Robert wanted to know how many a million (1,000,000) really is. He took a pint bottle and counted the number of small dried beans needed to fill it. It held 984 of them. He said to himself, "I'll let 1,000 be the number of beans in a pint. There are 1,000 thousands in a million. So 1,000 pint bottles hold 1 million beans."

1. How many quarts are there in 1,000 pints? How many gallons?

2. How many pint bottles would it take to hold 10,000 of the beans? 100,000 of the beans?

3. One million pint bottles would hold 1,000 million beans, or 1 billion beans. We write 1 billion as 1,000,000,000. Write 12 billion.

The chart below shows the number 4,276,593,081.

Billions			Millions			Thousands			Ones		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones
		4,	2	7	6,	5	9	3,	0	8	1

The number is divided into groups or **periods** of 3 figures each, counting from the right. The periods are separated by commas. The figures in each period are read in the same way. Read the number shown above. Then tell the name of the place in which each figure in the number is written.

Our Mighty Railroads

Read the numbers in the sentences below.

1. In a recent year there were 383,889 miles of railroad track in the United States. This was enough to lay more than 100 lines of track from New York to San Francisco.

2. There were 1,794,135 freight cars and 37,837 passenger cars.

3. There were 1,414,776 employees of the railroads.

4. More than $12,000,000,000 were spent from 1920 to 1940 to improve the railroads.

5. From July 1941 to August 1945 our railroads carried 874,356,000 barrels of petroleum and its products to the Atlantic Coast.

6. The total payroll of the railroads was $4,400,000,000. That year railroad workers earned on the average $3,090.

7. The average number of cross ties required for one mile of track is 2,997. There are about 991,587,000 cross ties in the tracks throughout the United States.

8. The average cost of building freight engines was: steam, $202,525; electric, $186,677; Diesel-electric, $133,455. Which cost most?

9. What are the five largest numbers above? Write them in order of their size.

★10. Find large numbers that tell facts about our country.

How Well Do You Remember?

These four tests will show you how well you remember how to work with whole numbers. Check your answers.

Addition Test

1.	2.	3.	4.	5.	6.
472	527	463	594	809	740
126	359	240	367	501	890

7.	8.	9.	10.	11.	12.
421	716	736	733	220	539
946	690	850	478	645	453
450	257	792	668	797	697
583	983	807	967	665	352
517	148	998	498	398	460

Subtraction Test

1.	2.	3.	4.	5.	6.
8147	7475	8375	2226	6029	8100
2536	6581	4097	1263	5824	2413

7.	8.	9.	10.	11.	12.
9568	9619	9748	9804	9813	8044
3749	8632	5570	7165	6099	4990

Multiplication Test

1.	2.	3.	4.	5.	6.
917	489	9070	964	5007	597
4	3	5	7	6	8

7.	8.	9.	10.	11.	12.
56	89	358	498	\$8.04	\$6.75
10	20	47	96	85	39

Division Test

1. $4\overline{)3036}$ 2. $7\overline{)6006}$ 3. $5\overline{)4000}$ 4. $6\overline{)5823}$ 5. $8\overline{)6472}$

6. $71\overline{)6106}$ 7. $62\overline{)3596}$ 8. $45\overline{)2700}$ 9. $84\overline{)59,136}$

10. $98\overline{)68,671}$ Page 7 will help you find needed practice.

How to Improve Your Work in Arithmetic

To help you to improve in arithmetic, use the reviews of important points and the diagnostic tests listed below.

Operation	Points to Watch	Diagnostic Tests
Addition of whole numbers	page 10	page 12
Subtraction of whole numbers	" 15	" 16
Multiplication of whole numbers	" 19	" 21
Division by one-place numbers	" 25	" 27
Division by two-place numbers	" 31	" 32

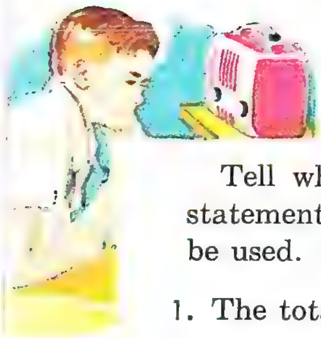
1. Did you have more than one incorrect example in the addition test on page 6? If so, turn to the points to watch in addition. To what page should you turn?

2. Next take the diagnostic test in addition of whole numbers. On what page is this test?

3. The diagnostic test tells you where to find the practice you need. Turn to pages 323 to 325 to find the practice exercises in addition. You can practice at any time by using the answers that are given to check your own work. The diagnostic test will show you which sets to practice.

4. After several weeks repeat the addition test on page 6. See how much your work has improved. Even if you made no mistakes in the addition test on page 6, you can improve your skill by careful practice.

5. Use the plan described above for addition to improve your work in the other processes.



A Radio Quiz

Tell what process to use to find the answer to each statement below. Sometimes more than one process can be used. Give a problem illustrating each statement.

1. The total number there are in several different groups.

2. How far a plane can fly in 5 hours at a given speed.

3. How many there are in several groups of the same size.

4. How many equal smaller groups of a certain size can be made from a large group.

5. The total cost of several things sold at the same price.

6. The number of ounces in several pounds.

7. The total of several amounts of money.

8. The average weight of four boys when you know their total weight.

9. How much greater one number is than another.

10. The number there are in half of a group.

11. The difference between two numbers.

12. The other number if you know one of the numbers and the sum of both.

13. The number remaining after several of a group leave.

14. The price of one when you know the cost of several.

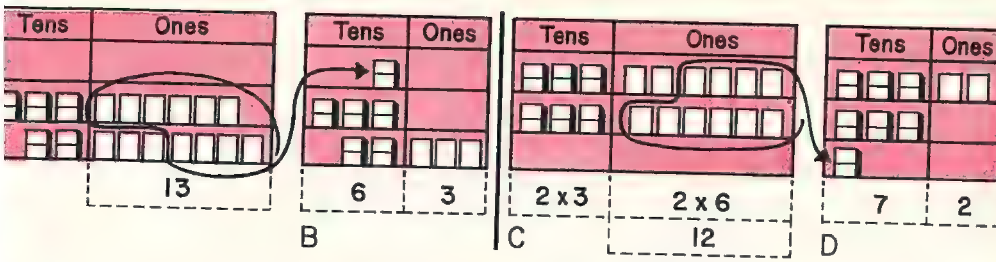
15. The number of quarts in a certain number of pints.

16. How many more cents you need before you can buy something costing more than the money you have.

17. The number of pieces of a certain length that can be cut from a long piece of ribbon.

18. How many times as much one number is as another number.

19. The change from $1 when you buy a loaf of bread.



Add or Multiply?

1. Place-value charts A and B show carrying in addition.

$$\begin{array}{r} 36 \\ +27 \\ \hline 63 \end{array}$$

Tell the upper number in A; the lower number. How many cards do you see in ones' pocket in A? 13 ones are the same as 1 ten and 3 ones. The upper line in B shows this. In B we carry 1 ten to the tens' pocket, as you can see.

Use A and B to explain the work in the example at the left.

2. What two numbers are shown in C? The two numbers are the same. So we can find their total either by adding or by multiplying. Use C and D to explain the work below.

$$\begin{array}{r} 36 \\ +36 \\ \hline 72 \end{array} \qquad \begin{array}{r} 36 \\ \times 2 \\ \hline 72 \end{array}$$

How do we get the 2 in the product of the multiplication example? How do we get the 7? How is carrying in multiplication different from carrying in addition?

3. Find in two ways the cost of 3 pounds of lard at 24 cents a pound.

4. Tom, Bob, and Harry each have 25 cents. Find in two ways the total amount of money the three boys have.

5. Mary has 2 nickels, 2 dimes, and 2 quarters. How can you find how many cents Mary has in all?

6. In a classroom there are 5 rows of desks. In each row there are 6 desks. How many desks are there in the 5 rows? Make a drawing showing the desks with small crosses.

★ 7. When do we add? When can we multiply?

Points to Watch in Addition of Whole Numbers

1. Be sure that you can give the sums for the addition facts quickly and correctly. The Self Helps for the addition facts on page 323 will give you the practice you need.

2. You must be able to find mentally the sums of any one-place number and any two-place number. In the example at the right, add down the column. Think: 7 and 9, 16; 16 and 4, 20; 20 and 6, 26. For practice on this step in addition, turn to page 324. To check the answer add from the bottom up.

7	
9	(16)
4	(20)
6	
26	

3. Be sure to carry the right number. Explain how to find the sums in the examples below.

a.	b.	c.	d.	e.	f.
420	48	536	496	708	152
360	39	291	278	207	748
780	87	827	774	915	900

4. Be careful when you copy numbers to be added. Be sure to write the ones under the ones, the tens under the tens, and so on. Why is this necessary?

459
5178
7

5. Copy and find the sums of the following examples. Check.

a. 379 + 564 + 785 + 978 =

b. 596 + 27 + 8 + 4937 =

c. \$6.75 + \$.85 + \$.09 + \$12.00 =

d. \$9.86 + \$.07 + \$5.48 + \$85.96 =

Next, take the diagnostic test in addition on page 12 to find the steps you should practice.

A Budget for Your Money

It is wise for children to plan the ways to spend the money they receive from others and the money they earn. Here is a **budget** (plan) that Robert Smith prepared showing the money he expected to receive (his income) during a week. It also shows the ways in which he planned to use it.

Budget for October 1 to October 8			
Income		Plan for Using Income	
Allowance from Dad	$1.00	Savings bank	$ .35
Earnings	$2.00	Lunches at school	1.25
Total	?	Carfare	.40
		Charity and church	.25
		Entertainment (movies, etc.)	.30
		Personal expenses (club dues, etc.)	.25
		Unforeseen expenses	.20
		Total	?

1. What did Robert estimate his total income for the week would be? Why is it a good plan for parents to give their children a small allowance? How can children earn their allowances? How can boys and girls earn money?

2. What is meant by each item in Robert's plan for using his income? Find the total amount for savings and expenses.

3. Suppose that Robert spends only $1.95 during the week. How much will he have left?

★4. Make a budget like Robert's for yourself.

Diagnostic Test in Addition

If you make more than one error in any row, turn to the page number given at the right. Be careful to watch the points given on page 10.

	a	b	c	d	
I	24	392	761	409	(325)
	31	403	200	300	
II	32	48	59	73	(325)
	49	57	78	67	
III	276	857	496	853	(325)
	208	192	467	849	
IV	305	270	601	908	(325)
	806	790	809	772	

	a	b	c	
V	44	79	976	(325)
	88	24	482	
	56	58	679	
	92	64	584	
	69	79	789	

	a	b	c	
VI	$74.96	$ .98	$ 9.85	(325)
	.27	64.85	.07	
	5.83	.27	.68	
	.09	1.89	53.99	

Questions about Your Work on the Addition Test

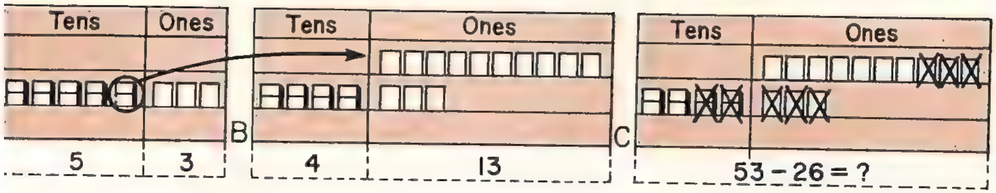
1. When you were adding, did you ever stop to count or to work out a sum? If you did, you need to do special work on the Self Helps on pages 323 and 324.

2. Did you have any difficulties in carrying in sets **II** and **III**? How are the examples in **II** different from those in **III**?

3. Did you have any difficulty with zeros in sets **I** and **IV**? In which examples in set **IV** was it necessary to write 0 in the sum? Why?

4. In adding in sets **V** and **VI** did you add the figures in order as given? Did you skip around in any of the columns? Why is it better to add the figures in the order given?

5. What is the main point to watch in copying and working the examples in set **VI**?



How to Regroup in Subtraction

The place-value charts show the meaning of regrouping in subtracting in the example, 53 − 26. Explain the work in the steps.

$$\begin{array}{rr} {\scriptstyle 4} & {\scriptstyle 13} \\ \cancel{5} & \cancel{3} \\ -2 & 6 \\ \hline 2 & 7 \end{array}$$

1. In this example we cannot subtract 6 from 3. So we change 1 of the 5 tens to 10 ones, as shown in A and B. Then we have 13 ones. The 53 is regrouped as 4 tens and 13 ones. Now subtract, first the ones then the tens, as shown in C. 13 − 6 = ?; 4 − 2 = ? The remainder is 27. To check, add 26 and 27. The sum is 53. So the work checks.

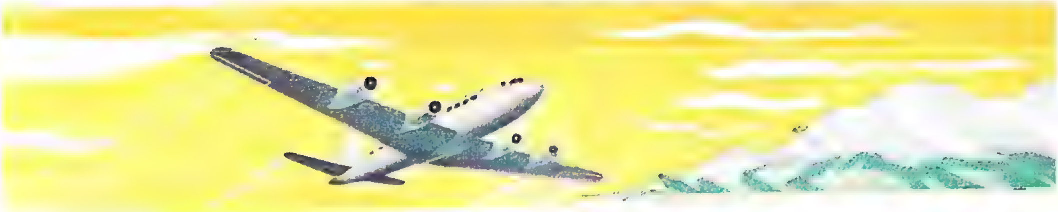
$$\begin{array}{rr} {\scriptstyle 5} & {\scriptstyle 10} \\ \cancel{6} & \cancel{0} \\ -1 & 3 \\ \hline 4 & 7 \end{array}$$

2. Explain the work in the example 60 − 13. How do we get the 5? How do we get the 10? Prove that 47 is the correct answer.

3. Explain the steps shown in each example below.

a. $\begin{array}{rr} {\scriptstyle 4} & {\scriptstyle 10} \\ \cancel{5} & \cancel{0} \\ 2 & 4 \\ \hline 2 & 6 \end{array}$ b. $\begin{array}{rrr} & {\scriptstyle 7} & {\scriptstyle 14} \\ 5 & \cancel{8} & \cancel{4} \\ 2 & 3 & 6 \\ \hline 3 & 4 & 8 \end{array}$ c. $\begin{array}{rrr} {\scriptstyle 7} & {\scriptstyle 12} & \\ \cancel{8} & \cancel{2} & 7 \\ 2 & 5 & 7 \\ \hline 5 & 7 & 0 \end{array}$ d. $\begin{array}{rrr} & {\scriptstyle 11} & \\ {\scriptstyle 7} & \cancel{1} & {\scriptstyle 13} \\ \cancel{8} & \cancel{2} & \cancel{3} \\ 2 & 5 & 4 \\ \hline 5 & 6 & 9 \end{array}$

4. Now copy the four examples without any of the work and subtract. Check your answers. Be sure that you understand how to work them.



The Cost of Flying

One day Tommy and Mary saw this list of airplane fares for the winter months.

Fares from Chicago to

Destination	Regular Round Trip	15-Day Round Trip
London	$740.60	$483.10
Paris	$775.90	$521.10
Rome	$896.90	$612.60
Athens	$1,015.30	$739.70

1. What was the regular round-trip fare from Chicago to London?

We read this fare as 740 dollars **and** 60 cents. The **and** separates dollars and cents. It also shows where the decimal point is written. Why would it not be correct to read 74,060 as 74 thousand and sixty?

2. How much more was the regular round-trip fare to Paris than to London? How much more was the 15-day round-trip fare to Paris than to London?

3. How much less was the 15-day round-trip fare to London than the regular round-trip fare?

4. How much more was the regular round-trip fare than the 15-day round-trip fare to Paris? to Rome? to Athens?

5. What was the cost of 3 round-trip tickets to Athens at the regular rates? at the 15-day rate?

6. How much more did 2 fares to Paris at the regular rate cost than at the 15-day rate?

7. Children of ages 2 to 12 years pay only half fare. What was the cost of a round-trip ticket to Rome for an 11-year-old child at the regular round-trip rate? at the 15-day rate?

★8. Why do airline companies often reduce fares to other countries during the winter months?

Points to Watch in Subtraction

1. Can you give the answers to the subtraction facts quickly, without counting or guessing? Turn for practice to the Self Helps on subtraction facts on page 326.

2. Explain how the upper number in each example below must be changed so that you can subtract.

a.	b.	c.	d.	e.
32	529	341	4192	5178
24	149	196	2728	4979

3. You must understand how to work with zeros in subtraction. Explain the work given for each example.

a. $\begin{array}{r} 860 \\ \underline{854} \end{array} = \begin{array}{ccc} & 5 & 10 \\ 8 & \cancel{6} & \cancel{0} \\ 8 & 5 & 4 \\ \hline & & 6 \end{array}$ b. $\begin{array}{r} 700 \\ \underline{635} \end{array} = \begin{array}{ccc} & 9 & \\ 6 & \cancel{10} & 10 \\ \cancel{7} & \cancel{0} & \cancel{0} \\ 6 & 3 & 5 \\ \hline & 6 & 5 \end{array}$ c. $\begin{array}{r} 801 \\ \underline{206} \end{array} = \begin{array}{ccc} & 9 & \\ 7 & \cancel{10} & 11 \\ \cancel{8} & \cancel{0} & \cancel{1} \\ 2 & 0 & 6 \\ \hline 5 & 9 & 5 \end{array}$

Copy the examples and subtract. Do not write out the regrouping as shown above.

4. Write the numbers to be subtracted so that ones are under ones, tens under tens, and so on.

5. Watch the points above in working these examples:

a. 3695 − 1725 = c. 99,647 − 8,579 = e. 8040 − 8034 =

b. 8090 − 1573 = d. $98.01 − $7.56 = f. 9001 − 2063 =

Now take the diagnostic test in subtraction of whole numbers on page 16.

Diagnostic Test in Subtraction

Did you make more than one error in any row of examples? Turn for practice to the page given at the end of the row.

	a	b	c	
I	$\begin{array}{r}243\\ \underline{102}\end{array}$	$\begin{array}{r}587\\ \underline{427}\end{array}$	$\begin{array}{r}698\\ \underline{692}\end{array}$	(327)
II	$\begin{array}{r}817\\ \underline{274}\end{array}$	$\begin{array}{r}536\\ \underline{329}\end{array}$	$\begin{array}{r}652\\ \underline{618}\end{array}$	(327)
III	$\begin{array}{r}983\\ \underline{287}\end{array}$	$\begin{array}{r}723\\ \underline{258}\end{array}$	$\begin{array}{r}496\\ \underline{397}\end{array}$	(327)

	a	b	c	
IV	$\begin{array}{r}804\\ \underline{392}\end{array}$	$\begin{array}{r}802\\ \underline{417}\end{array}$	$\begin{array}{r}720\\ \underline{378}\end{array}$	(328)
V	$\begin{array}{r}900\\ \underline{427}\end{array}$	$\begin{array}{r}801\\ \underline{639}\end{array}$	$\begin{array}{r}910\\ \underline{143}\end{array}$	(328)
VI	$\begin{array}{r}9070\\ \underline{2080}\end{array}$	$\begin{array}{r}9000\\ \underline{3125}\end{array}$	$\begin{array}{r}8005\\ \underline{1605}\end{array}$	(328)

★ How Number Processes Are Related

$$\begin{array}{r}805\\ \underline{+679}\\ 1484\end{array}$$

1. How can you use the addition example at the right to tell what the answer to 1484 − 679 is? What is the answer to 1484 − 805?

2. How can you prove, using the subtraction example, that 247 + 687 equals 934?

$$\begin{array}{r}934\\ \underline{-687}\\ 247\end{array}$$

3. How can you use the subtraction example to prove that 934 − 247 equals 687?

$$\begin{array}{r}84\\ \underline{\times 6}\\ 504\end{array}$$

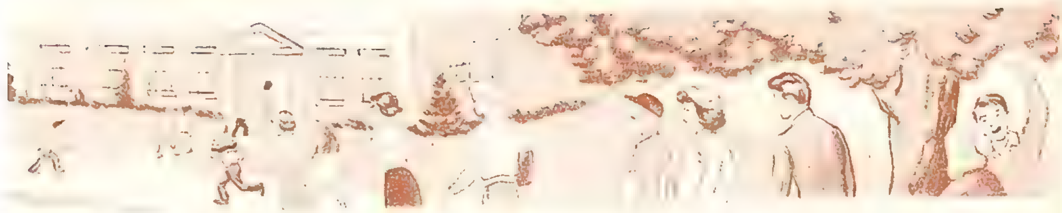
4. How can you check the answer to the multiplication example by using division?

5. How can you use the example to tell what the quotient is of $6\overline{)504}$? What is the quotient of $84\overline{)504}$?

$$\begin{array}{r}8\\ 75\overline{)600}\\ \underline{600}\end{array}$$

6. How can you use the division example to tell how much 8 × 75 is? How much is $8\overline{)600}$?

7. Which of these numbers can be divided by 5 with no remainder? How can you tell? 360 432 1035 1773



Rounding Off Large Numbers

In the Homeville School there are 385 children. Using **round numbers** we can say that there are **about** 400 children in the school. 385 is nearer to 400 than to 300. In using round numbers we replace the figures at the end of numbers with zeros. The first two or three figures give us a good idea of what the actual number is.

1. Is 628 nearer to 600 or to 700?

Rounded off to the nearest hundred, 628 is 600 because 628 is nearer to 600 than to 700.

2. Round off to the nearest hundred:

218	476	336	4567	12,932

3. Show that 750 is halfway between 700 and 800.

We say that 750 rounded off to the nearest hundred is 800. The number 35 rounded off to the nearest ten is 40.

The rules for rounding off numbers are as follows:

a. When the first figure to be dropped is 5 or more, we add 1 to the next figure at the left. Thus, 85 to the nearest ten is 90, and 595 to the nearest hundred is 600.

b. When the first figure to be dropped is less than 5, drop it. Thus 53 to the nearest ten is 50, and 842 to the nearest hundred is 800.

c. Replace all figures dropped with zeros.

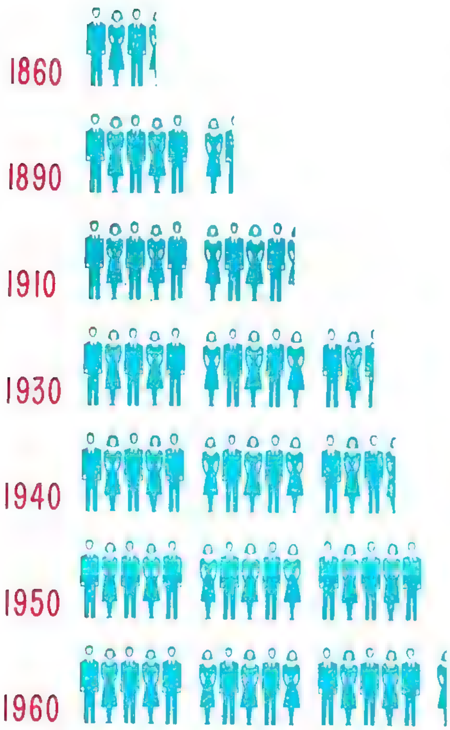
4. Which of these numbers would you round off to 4000?

3976	3500	4182	3036	4309

5. Round off to the nearest ten; then to the nearest hundred; then to the nearest thousand:

3675	9358	18,704	376,500	220,469

How Our Population Has Grown



EACH SYMBOL REPRESENTS TEN MILLION PEOPLE

This picture graph shows how our population has grown and what it is expected to be by 1960. We cannot tell the exact numbers but we can estimate to the nearest ten million.

1. What is the earliest year in the graph? the latest year?

2. Each little symbol stands for how many people?

3. About how many people lived in the United States in 1860? You can see that the total was a little more than 30 million. To the nearest ten million the population was 30 million.

4. What was the population in 1910, to the nearest ten million?

5. What was the population in 1950, to the nearest ten million?

6. About how many million more will the population probably be in 1960 than it was in 1950?

7. Show that the population in 1910 was about three times as large as the population in 1860.

★8. Make a graph showing to the nearest million the population of your home state. Use () to represent 1 million.

Points to Watch in Multiplication

1. Be sure that you can give the products of the 90 multiplication facts quickly and correctly. For practice turn to the Self Helps on multiplication facts on page 329.

2. Be sure that you carry correctly when you multiply. The practice exercises on page 324 will help you to learn to carry correctly. Explain how carrying is used in working each example below. Then copy and work the examples.

a.	b.	c.	d.	e.
$\begin{array}{r} 87 \\ \underline{9} \\ 783 \end{array}$	$\begin{array}{r} 415 \\ \underline{6} \\ 2490 \end{array}$	$\begin{array}{r} 307 \\ \underline{5} \\ 1535 \end{array}$	$\begin{array}{r} 396 \\ \underline{7} \\ 2772 \end{array}$	$\begin{array}{r} 8090 \\ \underline{4} \\ 32{,}360 \end{array}$

3. In multiplying by two-place numbers be sure to place the partial products correctly. Explain each step in the work below. Then copy and work the examples.

a.	b.	c.	d.
$\begin{array}{r} 27 \\ \underline{10} \\ 270 \end{array}$	$\begin{array}{r} 56 \\ \underline{20} \\ 1120 \end{array}$	$\begin{array}{rl} 38 & \\ \underline{21} & \\ 38 & (1 \times 38) \\ \underline{760} & (20 \times 38) \\ 798 & \end{array}$	$\begin{array}{rl} 972 & \\ \underline{37} & \\ 6\ 804 & (7 \times 972) \\ \underline{29\ 160} & (30 \times 972) \\ 35{,}964 & \end{array}$

4. Be careful about the three points given in 1, 2, and 3 in working the examples below:

a. $2 \times 618 =$ c. $7 \times 3495 =$ e. $9 \times 9070 =$ g. $86 \times 97 =$

b. $3 \times 395 =$ d. $8 \times 8004 =$ f. $90 \times 40 =$ h. $85 \times 396 =$

Next take the diagnostic test in multiplication on page 21 to find the practice you need.

How Much Does a Year's Schooling Cost?

Have you any idea how much a year's schooling costs? Below are given the average yearly costs for one pupil in three small midwestern cities in two different years.

Year	City A	City B	City C
1933-34	$99	$66	$78
1950-51	$230	$197	$312

1. For what two years are the average yearly costs given?

2. For which city were costs highest in 1933-34? For which city were they highest in 1950-51?

3. What was the increase in costs between the two years for City A? for City B? for City C? Explain the increase.

4. In which city were the costs for 1950-51 **approximately** (about) three times the costs for 1933-34? In which city were they about four times the costs of 1933-34?

5. How much was the total yearly cost for a class of 32 children in each city in 1933-34? How much in 1950-51? Find the difference in the total costs for each city.

6. Use the average yearly cost figures for 1950-51. What would be the total cost of sending a child to school for 12 years in City A? in City B? in City C?

★7. How can children help the schools to save money?

Diagnostic Test in Multiplication

If you make errors in any row, turn for special practice to the page given at the right.

	a	b	c			a	b	c	
I	42 3	32 5	58 7	(330)	IV	58 10	527 20	\$2.40 40	(331)
II	300 6	240 8	601 9	(330)	V	89 35	97 58	\$.69 78	(331)
III	306 7	408 5	309 8	(330)	VI	365 48	\$4.89 96	\$90.76 75	(331)

★ Finding Missing Numbers

What figures should be where there are question marks?

1.	4?6 +?39 735	5?8? +2798 ?8?8	890? +???6 18,613	65,??4 +39,81? 1??,750
2.	3964 −???? 2105	???? −6276 3539	8040 −?6?4 4?5?	7006 −?80? 41?9
3.	7?4 ×8 5792	364 ×?? 3640	295 ×?0 5900	???? ×8 72,560
4.	244 4)97?	630 6)3??0	258 5)????	584 r3 8)????

5. You know that 15 = 3 × 5. Show that the product of 15 × 67 is the same as 3 times the product of 5 × 67.

6. Show two ways to find 27 × 196.

How to Estimate When We Multiply

We can often save time by estimating the answer. Estimating also helps us to see if our answers are sensible. Let us see how we can use round numbers to estimate when we multiply two numbers.

1. How much do 9 barrels of flour weigh if a barrel weighs 196 pounds?

How to Find the Answer

$$\begin{array}{r} 196 \\ \times 9 \\ \hline 1764 \end{array}$$

How to Estimate the Answer

$$9 \times 200 = 1800$$

Think: 9×196 lb. = ? lb.

The first example shows how we usually do the work by writing it out.

When we estimate, we think: 196 pounds is about the same as 200 pounds. We can multiply 200 by 9 mentally. How much is 9×200?

1764 is about the same as 1800. So we know that 1764 is a sensible answer.

2. Estimate the answer for each of the following examples. Write it on your paper. Then multiply the numbers. Decide whether or not your answer is sensible by comparing it with your estimate.

a. $\begin{array}{r} 89 \\ \times 9 \\ \hline \end{array}$ b. $\begin{array}{r} 413 \\ \times 8 \\ \hline \end{array}$ c. $\begin{array}{r} 386 \\ \times 9 \\ \hline \end{array}$ d. $\begin{array}{r} 215 \\ \times 7 \\ \hline \end{array}$ e. $\begin{array}{r} 3906 \\ \times 9 \\ \hline \end{array}$

In example a it is better to think of 89 as 90 when making an estimate. When we change 89 to 90 we are rounding off 89 to the nearest ten. In example b we can round off 413 to 400. We round off 413 to the nearest hundred.

3. Use round numbers to estimate the answers in c, d, and e.

The School Carnival

The Blake School had a carnival to raise money to buy a motion picture camera.

1. The table gives the number of tickets that were bought by the children of each grade. It also gives the number of adult tickets they sold. How many tickets did the children buy?

Grade	Number of Tickets Children	Adult
I	14	30
II	16	50
III	23	48
IV	31	59
V	38	53
VI	43	67
Total	?	?

2. What was the total amount the children paid for their tickets at 15 cents each?

3. How many adult tickets were sold?

4. The adult tickets cost 35 cents each. How much was received from the sale of adult tickets?

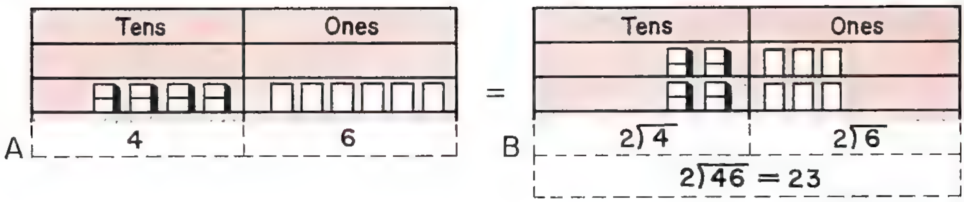
5. On carnival night 24 children's tickets and 46 adult tickets were sold. How much was received for these tickets?

6. Find the total amount received for all of the tickets sold.

7. The expenses were \$2.50 for the tickets, \$8.56 for decorations, and \$12.65 for costumes. Find the total expenses.

8. How much of the money received for the tickets remained after the expenses were paid?

★9. Find out about the cost of motion picture cameras.

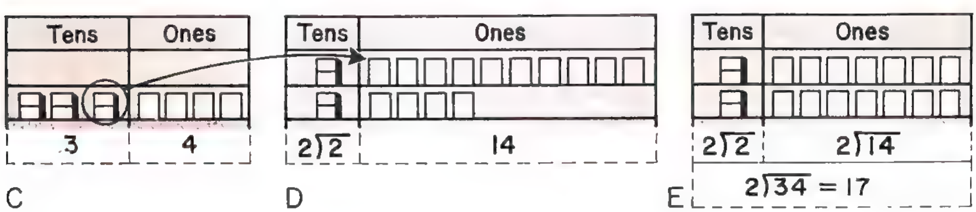


Showing Regrouping in Division

A and B show the steps in working the example $2\overline{)46}$. The work shows 46 divided into two equal parts.

$$\begin{array}{r} 23 \\ 2\overline{)46} \end{array}$$

1. How many tens are there in 46? How many ones? If we divide the 4 tens into 2 equal parts, how many tens are there in each part? This is shown in B. If we divide the 6 ones into 2 equal parts, how many ones are there in each part? What is the quotient?



2. Charts C, D, and E show the steps in finding $2\overline{)34}$. Why must the cards in C be grouped as in D? Show that 2 tens and 14 ones are the same as 34 ones.

We put $^{\times}$ under the figures we bring down.

Use charts C, D, and E to explain the steps in working the example at the left. $2 \times 17 = ?$

$$\begin{array}{r} 17 \\ 2\overline{)34} \\ 2^{\times} \\ \hline 14 \\ 14 \\ \hline \end{array}$$

How Do We Divide?

Explain the work in each example below.

1. $\begin{array}{r} 56 \\ 3\overline{)168} \\ 15^{\times} \\ \hline 18 \\ 18 \\ \hline \end{array}$

2. $\begin{array}{r} 87 \text{ r4} \\ 7\overline{)613} \\ 56^{\times} \\ \hline 53 \\ 49 \\ \hline 4 \end{array}$

3. $\begin{array}{r} 905 \\ 6\overline{)5430} \\ 54^{\times\times} \\ \hline 30 \\ 30 \\ \hline \end{array}$

4. $\begin{array}{r} 50 \text{ r3} \\ 8\overline{)403} \\ 40^{\times} \\ \hline 3 \end{array}$

Points to Watch in Division by One-Place Numbers

1. Be sure that you can give the quotients of the 90 division facts quickly and correctly. For practice turn to the Self Helps on the division facts on page 332.

2. You must also be able to tell quickly the quotients for the facts used in uneven division. For instance, in the example at the right, name the quotient of $4\overline{)27}$ and $4\overline{)39}$. For practice with uneven division, turn to page 333.

$$\begin{array}{r} 69 \text{ r}3 \\ 4\overline{)279} \\ \underline{24^{\times}} \\ 39 \\ \underline{36} \\ 3 \end{array}$$

3. Be careful about subtraction in division examples. Tell what numbers were subtracted in the example above. Do extra work on the Self Helps in subtraction. Be sure to subtract correctly in division examples.

4. Be sure to write the first quotient figure in the right place when you divide. Be careful about zeros in quotients. Whenever you cannot divide, as in the example at the right, write 0 in the quotient. Explain the example.

$$\begin{array}{r} 80 \text{ r}3 \\ 5\overline{)403} \\ \underline{40^{\times}} \\ 3 \end{array}$$

5. Always go over your work to find any errors. Check your answers.

6. Now copy the 12 examples below and divide.

a. $2\overline{)84}$	d. $6\overline{)1836}$	g. $5\overline{)78}$	j. $7\overline{)3220}$
b. $3\overline{)960}$	e. $9\overline{)4540}$	h. $4\overline{)308}$	k. $8\overline{)5000}$
c. $7\overline{)700}$	f. $3\overline{)81}$	i. $8\overline{)563}$	l. $9\overline{)7287}$

Next, take the diagnostic test in division on page 27 to find the steps in division that you should practice.

A Summer Nursery School

Five girls offered to make fresh orange juice for the children in a nursery school. They charged 30 cents a week for each child. The nursery school met every day except Sunday.

1. How much did the girls charge a day for one child?

2. An average of 18 children attended the nursery school daily. There were 21 children enrolled in the school. How many less than the total number enrolled was the average number who attended?

3. How much would the girls receive a week for orange juice for 21 children?

4. There were 5 girls in the group. How much would each one's share be, if they shared this money equally?

5. Some mothers gave extra money each week to buy play materials. One week the school bought 6 boxes of crayons at 10 cents each. It also bought 4 bundles of paper at 20 cents each, and toys costing $4.20. How much was spent for these play materials?

6. The girls charged 15 cents a day for juice if a child was in school only one or two days. One week there were 3 children who were there 1 day each. There were 2 children who were there 2 days each. Find the total amount the girls received for orange juice for these five children.

Diagnostic Test in Division by One-Place Numbers

	a	b	c		a	b	c
I	$2\overline{)86}$	$3\overline{)93}$	$4\overline{)848}$	V	$6\overline{)497}$	$9\overline{)408}$	$8\overline{)547}$
II	$4\overline{)240}$	$8\overline{)648}$	$9\overline{)729}$	VI	$7\overline{)2520}$	$3\overline{)2220}$	$8\overline{)5920}$
III	$3\overline{)84}$	$2\overline{)52}$	$6\overline{)90}$	VII	$9\overline{)4560}$	$6\overline{)5447}$	$7\overline{)1449}$
IV	$5\overline{)79}$	$7\overline{)94}$	$4\overline{)97}$	VIII	$8\overline{)485}$	$5\overline{)204}$	$7\overline{)5116}$

If you make errors in any example, turn for practice to pages 333 and 334.

★What Is the Missing Number?

Tell what the missing number is. Do you need a pencil?

1. 14 + ? = 32	11. ? ÷ 8 = 9	21. 35 + ? = 42
2. 40 − ? = 12	12. ? + 16 = 60	22. 48 ÷ ? = 6
3. 54 ÷ ? = 6	13. ? − 8 = 43	23. 26 − ? = 9
4. ? ÷ 15 = 3	14. 6 × ? = 96	24. 9 × ? = 180
5. 3 × ? = 48	15. 36 ÷ ? = 9	25. 42 + ? = 61
6. ? − 35 = 8	16. ? + 34 = 72	26. 81 ÷ ? = 9
7. 18 × ? = 72	17. ? × 14 = 70	27. 24 × ? = 0
8. 42 + ? = 80	18. 24 − ? = 7	28. 31 − ? = 24
9. ? × 5 = 60	19. 14 × ? = 84	29. ? + 16 = 31
10. 45 ÷ ? = 5	20. 8 × ? = 96	30. 30 ÷ ? = 15

31. $\begin{array}{r} 5?7 \\ +?7? \\ \hline 1006 \end{array}$ 32. $\begin{array}{r} 853 \\ -??? \\ \hline 276 \end{array}$ 33. $\begin{array}{r} 453 \\ \times ? \\ \hline 2718 \end{array}$ 34. $\begin{array}{r} 243 \\ 7\overline{)????} \end{array}$ 35. $\begin{array}{r} 5?4 \\ 8\overline{)403?} \end{array}$

Finding Part of a Number

1. How many doughnuts are there in $\frac{1}{2}$ dozen?

   Think: $12 = 1$ dozen. $\frac{1}{2}$ of $12 = 2\overline{)12} = ?$

2. How many are $\frac{1}{4}$ dozen eggs?
3. How many minutes are there in $\frac{1}{3}$ hour?
4. How many ounces are there in $\frac{1}{8}$ pound?
5. How many inches are there in $\frac{1}{2}$ yard?

Find the answers.

	a	b	c	d
6.	$\frac{1}{4}$ of 16 =	$\frac{1}{4}$ of 36 =	$\frac{1}{8}$ of 64 =	$\frac{1}{7}$ of 56 =
7.	$\frac{1}{4}$ of 80 =	$\frac{1}{2}$ of 60 =	$\frac{1}{3}$ of 96 =	$\frac{1}{2}$ of 48 =
8.	$\frac{1}{5}$ of 60 =	$\frac{1}{4}$ of 52 =	$\frac{1}{2}$ of 78 =	$\frac{1}{8}$ of 96 =
9.	$\frac{1}{4}$ of 172 =	$\frac{1}{2}$ of 190 =	$\frac{1}{8}$ of 144 =	$\frac{1}{6}$ of 204 =

Four Ways to Find the Quotient

1. Show how you can add 64's to find the quotient in the example at the right. **$64\overline{)384}$**

2. Show how you can subtract 66's from 528 to find how many 66's you can take out of 528. **$66\overline{)528}$**

3. Show how you can multiply to find how many 68's equal 476. **$68\overline{)476}$**

4. Show how to divide to find how many 65's there are in 585. **$65\overline{)585}$**

5. Find the quotient of $675 \div 75$ in the above four ways.

6. Show that division is a quick way to find how often we can subtract the same number from another number.

How to Estimate When We Divide

To tell whether the answer to a division example is sensible, estimate the answer.

1. How much is $9\overline{)2691}$?

A. By Division

$$\begin{array}{r} 299 \\ 9\overline{)2691} \\ \underline{18}^{\times\times} \\ 89 \\ \underline{81} \\ 81 \\ \underline{81} \end{array}$$

B. By Estimation

$$\begin{array}{r} 300 \\ 9\overline{)2700} \end{array}$$

In A we find the exact quotient by division.

In B we round off 2691 to the nearest hundred, or 2700. We can see at a glance that $9\overline{)2700}$ is 300. This is approximately (about) the same as the answer in A.

So 299 is a sensible answer.

2. Write down an estimate of the answer to each example below, using round numbers. Then divide the numbers. Compare your estimate with the quotient you get.

a. $8\overline{)4784}$ b. $6\overline{)5937}$ c. $9\overline{)7164}$ d. $7\overline{)6328}$

3. Use estimation to see if the quotient given below is correct.

$$\begin{array}{r} 5 \\ 69\overline{)358} \end{array}$$

Think: 69 is about the same as 70. How much is 5 × 70? Since 350 is less than 358, 5 probably is the correct quotient. Complete the example to see if 5 × 69 is less than 358.

In each of the following first use estimation to find which part is more. Then multiply to see if you were right.

	a	b	c
4.	3 × 48, or 147	6 × 49, or 293	8 × 59, or 480
5.	3 × 64, or 200	7 × 38, or 236	5 × 48, or 231
6.	4 × 72, or 306	9 × 62, or 556	9 × 69, or 628

Arithmetic at the Grocery Store

1. Tommy Smith bought a can of peaches. The can cost \$.29. He gave the clerk a half dollar. How much change should he receive?

2. How much does $\frac{1}{2}$ pound of butter cost at \$.78 a pound?

3. Alice saw a box of breakfast food that weighed 14 ounces. How many ounces less than a pound did the box weigh?

4. The sales slip shows what Mrs. Smith bought one morning. How many loaves of bread did she buy?

Jones Grocery
48 Lincoln Ave.
Chicago, Illinois

Sold to: *Mrs. J. Smith*

2 bread		36
3 doz. eggs	1	92
4 qt. milk		76
2 heads of lettuce		24
	3	28

5. How much did she pay for one loaf of bread?

6. How much were the eggs a dozen?

7. How much was the milk a quart?

8. How much was the lettuce a head?

9. How much was the total amount Mrs. Smith spent? See if the sum given on the sales slip is correct.

10. She gave the clerk a \$5 bill to pay for the groceries. How much change did she receive?

★11. See if you can find a sales slip at home. Check it to see if the amount paid is correct. Why is it a good plan to check sales slips and also the change received?

★12. In some stores adding machines are used to find how much customers must pay. Why is this a good plan?

Points to Watch in Division by Two-Place Numbers

1. To estimate the quotient figure in this example, use the 2 in tens' place as the **guide figure**. See $2\overline{)8}$. This is 4. We write 4 in ones' place in the quotient because we are dividing 85 ones by 21.

$$\begin{array}{r} 4 \text{ r}1 \\ 21\overline{)85} \\ \underline{84} \\ 1 \end{array}$$

Tell how the quotient figures below were found and complete the examples.

a. $\begin{array}{r} 4 \\ 20\overline{)80} \end{array}$ b. $\begin{array}{r} 3 \\ 30\overline{)96} \end{array}$ c. $\begin{array}{r} 2 \\ 41\overline{)95} \end{array}$ d. $\begin{array}{r} 3 \\ 23\overline{)78} \end{array}$

2. To find the quotient of $30\overline{)156}$, think of 156 as 15 tens and 6 ones. See $3\overline{)15}$. This is 5. We write the 5 in ones' place in the quotient. Why?

$$\begin{array}{r} 5 \text{ r}6 \\ 30\overline{)156} \\ \underline{150} \\ 6 \end{array}$$

Tell how to find the quotient in each example below. Then, complete the work.

a. $\begin{array}{r} 6 \\ 20\overline{)120} \end{array}$ b. $\begin{array}{r} 4 \\ 40\overline{)176} \end{array}$ c. $\begin{array}{r} 6 \\ 21\overline{)138} \end{array}$ d. $\begin{array}{r} 6 \\ 45\overline{)279} \end{array}$

3. Be sure to multiply and to subtract correctly.

4. Show that the quotient figures are placed correctly.

a. $\begin{array}{r} 3 \\ 23\overline{)713} \end{array}$ b. $\begin{array}{r} 6 \\ 43\overline{)2709} \end{array}$ c. $\begin{array}{r} 2 \\ 32\overline{)6735} \end{array}$ d. $\begin{array}{r} 2 \\ 92\overline{)19{,}688} \end{array}$

5. Write 0 in the quotient to hold empty places. Tell why.

6. Watch the points above in working these examples:

a. $20\overline{)67}$	d. $24\overline{)78}$	g. $62\overline{)251}$	j. $77\overline{)6273}$
b. $30\overline{)74}$	e. $30\overline{)188}$	h. $56\overline{)297}$	k. $95\overline{)5704}$
c. $41\overline{)97}$	f. $40\overline{)379}$	i. $94\overline{)706}$	l. $86\overline{)34{,}916}$

Now take the diagnostic test on page 32.

Diagnostic Test in Division by Two-Place Numbers

Part I. Naming Quotients

	a	b		a	b
1.	10)40	10)57	5.	31)186	52)159
2.	20)60	30)98	6.	36)72	46)95
3.	40)200	50)267	7.	64)448	86)516
4.	22)66	43)87	8.	94)692	76)332

If you had errors in any row of examples, turn to page 335 for help and special practice.

Do not take **Part II** of the test until you complete **Part I.**

Part II. The Complete Process

	a	b	c	d
1.	25)575	34)714	43)519	21)493
2.	21)1155	34)1768	92)3423	45)2393
3.	56)8456	45)9585	32)7840	92)19,688

If you had errors in any row of examples, turn to page 336 for special practice.

Part III. Zeros in Quotients

1.	43)1720	26)780	97)4859	86)6897
2.	23)4738	42)17,052	53)10,933	94)38,270
3.	64)5163	30)9009	32)6767	75)4537
4.	32)128,256	43)260,150	52)364,264	85)680,425

If you had errors in any row of examples, turn to page 337 for special practice.

Jack and His Dog, Pal

1. Jack feeds Pal a pound of horse meat three times a week. At 20 cents a pound find the cost of the meat for 4 weeks.

2. Jack also feeds Pal canned dog-food sold at 2 cans for 20 cents. How much do a dozen cans cost?

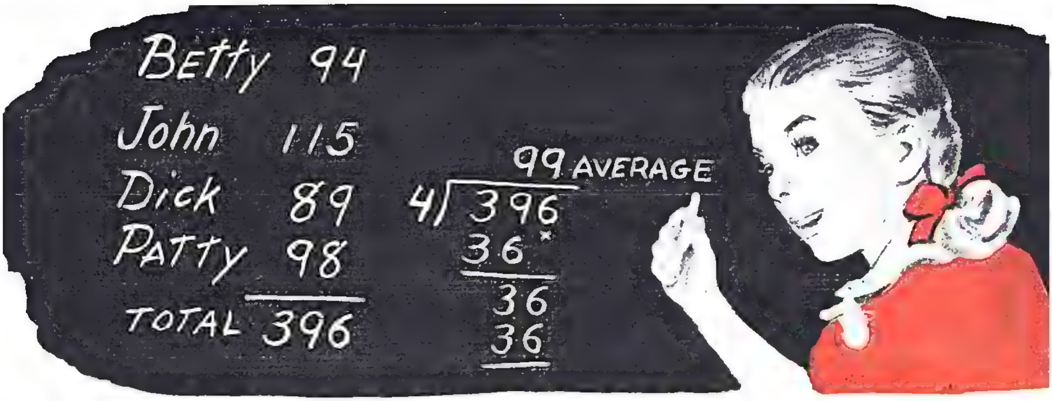
3. Another dog-food that Pal likes is sold at 3 cans for 32 cents. How much do a dozen cans cost?

4. One fall Pal was sick. Jack left him at an animal hospital for 4 days at a cost of $1.25 a day. The doctor charged $4.50 for his services. What was the total amount Jack had to pay the hospital?

5. Jack estimates that each year he spends $1.50 for medicine for Pal and $.75 for soap and powder. He also spends $1.75 to have Pal's hair cut and $2.00 for Pal's license. Find the total of these expenses.

6. At a dog show Jack saw a litter of 11 puppies valued at $3850. What was the average value of the puppies?

★7. Find out the cost of dog licenses where you live.



Why Use the Average?

The children in Miss Brown's class wanted a better idea of how much a million is. They decided to find out how long it would take a person to count a million small blocks. The list on the blackboard shows how many blocks four children counted in one minute.

1. Who counted the largest number of blocks in a minute? the smallest number?

2. Ann found the **average** number of blocks counted by four children in a minute. Explain how to find the average. Who counted more than the average number? Who counted fewer than the average number?

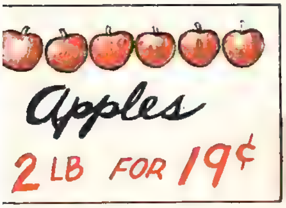
3. The class decided to use 100 as the number of blocks counted in a minute. Why was this a better figure to use than the exact average?

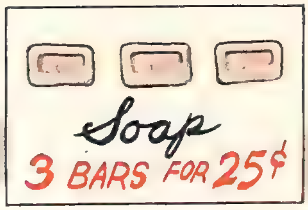
4. At the rate of 100 blocks a minute, how many minutes would it take to count 1,000 blocks?

5. How many thousands are there in 1 million? At the rate given in problem 4, how many minutes would it take to count 1 million blocks?

★6. Find the average time in which four children in your class can count 100 small objects.

★7. Give some uses of averages in daily life.





How Much Should We Pay?

1. How much do the apples cost a pound?

$$\begin{array}{r} 9\tfrac{1}{2}¢ \\ 2\overline{)19¢} \\ 18 \\ \hline 1 \end{array}$$

How much is $2\overline{)19}$?

To get the price a pound we divide the remainder 1 by 2. What is the price a pound?

2. Find the price of one bar of soap; of one melon.

3. Why must you pay the grocer 9 cents if you buy only one bar of soap at the price shown in the picture?

4. How much would be saved by buying 3 bars of soap at one time instead of three single bars?

5. How much would 6 pounds of apples cost at the price given in the picture?

Think: 6 lb. = 3 times 2 lb.
So 6 lb. cost 3 × 19¢, or ? ¢.

6. Find the cost of 6 bars of soap; of 9 bars; of 12 bars.

Find the cost of the following:

	Items	Prices
7.	4 lb. sugar	2 lb. for 19¢
8.	12 lb. apples	3 lb. for 25¢
9.	10 lb. potatoes	5 lb. for 25¢
10.	9 cans of corn	3 cans for 41¢

★11. Four bars of a special soap cost 25 cents. How many bars can you buy for 50 cents?

At the Rental Library

People who draw books from rental libraries pay a small charge for each day they have the book.

1. According to the sign how much does it cost to keep a book for a week?

The **minimum** or smallest charge for a book by the library is 10 cents.

2. Johnny had a book from the rental library for 3 days. How much did he have to pay the library?

3. Mary had a book from November 2 to November 16. How much did she have to pay the rental library? Do not count November 2.

4. Ann rented a book for 6 days. How much change should she have received from a half dollar?

5. A book cost the library \$2.50. For how many days must it be rented before the money received equals the cost of the book? Think: \$2.50 ÷ 2¢ is the same as 250¢ ÷ 2¢.

6. John paid 12 cents for a book from the rental library. For how many days did John have the book?

7. How much is the total charge for 3 books that are kept for 10 days?

★8. Where does the money come from to support public libraries?

Three Ways to Express Remainders

$$\begin{array}{r} 3 \text{ r}1 \\ 4\overline{)13} \\ 12 \\ \hline 1 \end{array}$$

1. How many balls do you see in A? Into how many groups of 4 each can the balls be divided? How many balls will remain?

$$\begin{array}{r} 2\frac{1}{2} \\ 2\overline{)5} \\ 4 \\ \hline 1 \end{array}$$

2. Suppose the apples you see in B are shared equally by 2 children. How many will each one receive? Would any apples remain?

$$\begin{array}{r} 6\frac{2}{3} \\ 3\overline{)20} \\ 18 \\ \hline 2 \end{array}$$

3. How much do 3 bars of soap cost? How much is that a bar? If you buy one bar of soap, do you pay 6 cents or 7 cents for it?

4. Explain the differences in the ways in which the remainders are expressed.

5. Betty had 11 pieces of fudge. She divided the fudge into two equal parts. How many pieces did she put in each part?

6. If 4 apples cost 15 cents, how much must you pay for one apple? for two apples?

7. Ann wants to cut 5 yards of ribbon into 4 equal pieces. How long should each piece be?

8. How many 20-cent tickets can you buy for 75 cents?

9. What is the average weight of 4 children if their total weight is 362 pounds?

10. How much does $\frac{1}{4}$ pound of ham cost at 79 cents a pound?

Learning to Estimate Answers

1. How much do 12 boxes of apples cost at $5.40 a box?

$$\begin{array}{r} \$5.40 \\ \times 12 \\ \hline 10\ 80 \\ 54\ 00 \\ \hline \$64.80 \end{array}$$

Think: 12 × $5.40 = ?

Here we are multiplying dollars and cents. You can tell that the answer will be a little more than $60 because 12 × $5 = $60. Why can the answer not be as much as $72?

How much do the 12 boxes of apples cost?

2. Tell the smallest number and the largest number of whole dollars there can be in each product. Then, multiply to see if the answer is between the two numbers.

a. $\begin{array}{r} \$5.96 \\ \times 8 \\ \hline \end{array}$ b. $\begin{array}{r} \$17.42 \\ \times 9 \\ \hline \end{array}$ c. $\begin{array}{r} \$3.56 \\ \times 24 \\ \hline \end{array}$ d. $\begin{array}{r} \$4.39 \\ \times 38 \\ \hline \end{array}$ e. $\begin{array}{r} \$8.74 \\ \times 64 \\ \hline \end{array}$

3. A farmer sold 8 boxes of apples for $25.76. How much did he receive a box for the apples?

$$\begin{array}{r} \$3.22 \\ 8\overline{)\$25.76} \\ 24\ ^{xx} \\ \hline 1\ 7 \\ 1\ 6 \\ \hline 16 \\ 16 \\ \hline \end{array}$$

Here we are dividing dollars and cents. The answer will be about $3.00 a box because $8\overline{)\$25}$ is a little more than $3. Be sure to put in the $ sign and to mark off the cents in the answer.

4. Tell the smallest number of dollars there can be in each quotient below. Then divide to see if your answer is correct.

a. $8\overline{)\$46.76}$ b. $4\overline{)\$39.72}$ c. $7\overline{)\$148.68}$ d. $6\overline{)\$327.84}$

5. Estimate the answers. Then, work the examples.

a. $\begin{array}{r} \$37.56 \\ \times 8 \\ \hline \end{array}$ b. $9\overline{)\$48.33}$ c. $\begin{array}{r} \$9.46 \\ \times 21 \\ \hline \end{array}$ d. $8\overline{)\$84.60}$

How to Estimate in Solving Problems

First, choose the one of the three answers given that you think is **nearest the correct answer.** Then, work the problem to see if your choice was correct. Sometimes you must add or subtract numbers to find an answer. Use rounded numbers to estimate your answer.

1. Bob weighs 91 pounds, Arthur 89 pounds, and Tommy 68 pounds. What is their total weight?

a. 200 pounds b. 250 pounds c. 300 pounds

2. Mary has saved $32.48 and Kate has saved $23.51. How much more has Mary saved than Kate?

a. $9.00 b. $10.00 c. $8.00

3. A fast airplane averages about 396 miles an hour. At that rate how far does it go in 8 hours?

a. 2700 miles b. 3900 miles c. 3200 miles

4. Find the cost of 9 desks at $12.85 each.

a. $90 b. $115 c. $130

5. The total weight of a truck load of 9 hogs was 2682 pounds. What was their average weight?

a. 200 lb. b. 500 lb. c. 300 lb.

6. Mr. Price paid $29.85 for 3 automobile tires for his car. How much did he pay for each tire?

a. $8.00 b. $9.00 c. $10.00

7. Bob wants to buy a $19.45 bicycle. He has saved $12.98. How much more does he need before he can buy the bicycle?

a. $7.00 b. $7.50 c. $8.00

8. Ted bought 2 pounds of butter at $.79 a pound and 2 loaves of bread at 18 cents a loaf. Find the total cost.

a. $1.50 b. $2.00 c. $2.50

A Billion-Dollar Rainbow

1. In a recent year the box office receipts of the motion picture industry were \$1,320,000,000. Write this number in words.

2. Find the average monthly receipts.

3. The 35 children of a certain class go to a school movie once a week. They pay 20 cents each for tickets. How much do the children spend for tickets in 4 weeks?

4. A certain 60-minute movie can be rented by a school for \$17.50. How many tickets must be sold at \$.05 each to pay for the movie? How many tickets at \$.10 each?

5. A school system can buy a color film about "song birds of the land" for \$30.00. The film can be rented for \$1.25 a day. Suppose the film is used by classes in different schools on 30 days. How much less is the actual cost of the film than the total rental charge would be?

6. Tommy read that a 25-foot movie film cost \$2.50, and a 100-foot film \$6.00. How much less would be the cost of one 100-foot film than four 25-foot films?

★ 7. Find the cost of renting motion picture films that can be shown in the home.

Getting Ready for the Progress Test

In each chapter there is a progress test on the work that has been studied. Let's get ready for the progress test on page 43.

Practice Test in Addition

	a	b	c	d	e
1.	968 427	501 709	628 571	$6.87 7.95	$8.76 5.28
2.	218 275 930 461	438 694 501 273	650 396 712 584	$3.75 8.28 9.41 6.07	$8.89 9.04 7.26 3.59

Practice Test in Subtraction

1.	8010 3197	7791 2849	8579 3726	8451 6159	7006 6540
2.	$54.30 32.82	$88.26 84.17	$90.20 41.63	$93.63 58.03	$156.24 95.07

Practice Test in Multiplication

1.	786 6	4016 7	831 8	1640 90	$67.25 80
2.	925 79	409 68	9008 32	7908 54	$70.38 79

Practice Test in Division

1.	8)6448	5)3795	6)5904	7)5600	9)7285
2.	12)384	62)3560	45)2700	24)768	96)$50.88
3.	56)8512	98)68,671	84)59,136	76)61,200	67)4029

Checking on Important Points

1. Round off to the nearest ten; to the nearest hundred; to the nearest thousand:

9138 12,725 6523 29,869

2. Round off to the nearest dollar:

\$3.15 \$4.50 \$27.85 \$.98 \$64.38

3. Explain how to use round numbers to estimate the answers of the examples below:

a. $\begin{array}{r} 4936 \\ +2183 \\ \hline \end{array}$ b. $\begin{array}{r} 9146 \\ -2859 \\ \hline \end{array}$ c. $\begin{array}{r} \$9.16 \\ \times 29 \\ \hline \end{array}$ d. $8\overline{)\$33.92}$

4. Write the smallest possible four-place whole number with 9 in tens' place.

5. How do you find the average of four numbers?

6. How can you tell that the quotient of $25\overline{)7525}$ is a three-place number?

7. Write a subtraction example in which zero is used as a place holder in the remainder.

8. How are multiplication and addition related?

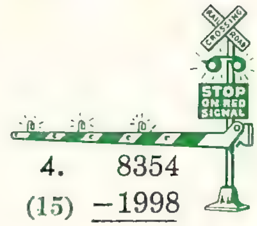
9. Show that division is a quick method of subtraction.

Vocabulary Exercise

Explain the meanings of the words below:

account	division	place value	remainder
average	estimate	price	round number
billion	fraction	product	sum
budget	million	quantity	unit
difference	ounce	quotient	whole

Progress Test I



1. (10) $\begin{array}{r}987\\879\\628\\564\\857\\\hline\end{array}$	2. (15) $\begin{array}{r}9001\\-4062\\\hline\end{array}$	3. (15) $\begin{array}{r}8143\\-2938\\\hline\end{array}$	4. (15) $\begin{array}{r}8354\\-1998\\\hline\end{array}$
	5. (15) $\begin{array}{r}8204\\-2907\\\hline\end{array}$	6. (19) $\begin{array}{r}8090\\\times 6\\\hline\end{array}$	7. (19) $\begin{array}{r}7009\\\times 8\\\hline\end{array}$
8. (19) $\begin{array}{r}97\\\times 10\\\hline\end{array}$	9. (19) $\begin{array}{r}86\\\times 20\\\hline\end{array}$	10. (19) $\begin{array}{r}97\\\times 76\\\hline\end{array}$	11. (19) $\begin{array}{r}\$8.59\\\times 98\\\hline\end{array}$
12. (24) $6\overline{)54{,}212}$	13. (24) $8\overline{)723}$	14. (28) $\frac{1}{4}$ of 80 =	15. (31) $10\overline{)430}$
16. (31) $20\overline{)1970}$	17. (31) $43\overline{)1806}$	18. (31) $85\overline{)3406}$	19. (31) $64\overline{)6915}$

20. Find the sum of 9896 + 653 + 9 + 8756.
(10)

For help, turn to the page given below the number of the example.

★For Those with No Work to Correct

1. What number added to 498 makes 1,000?

2. Write the two largest three-place numbers whose difference is 200.

3. Prove that the sum and the difference of two odd numbers are always even.

4. Write the largest possible four-place number in which there is a zero in hundreds' place.

5. What number multiplied by 32 gives a product of 800?

6. What number when divided by 20 gives a quotient of 24 and a remainder of 8?

Test in Problem Solving I

Let us see how well you can solve problems. How far up the scale can you go?

1. How many cents are there in a dime, 2 quarters, and a half dollar?

2. On a bicycle trip John rode 27 miles in 3 hours. How many miles did he average an hour?

3. Find the number of pints there are in 6 quarts.

4. Alice bought 3 loaves of bread at 19 cents a loaf. How much change did she receive from a dollar?

5. At 2 for 5 cents how many pieces of candy can you buy for 15 cents?

6. At $.20 each how many melons can be bought for $.80?

7. At a sale Tommy paid $28.75 for a bicycle. This was $5.75 less than the regular price. What was the regular price?

8. At 36 cents a dozen how much do 4 pencils cost?

9. Betty caught two fish. One weighed $2\frac{3}{4}$ pounds, the other $3\frac{1}{4}$ pounds. Find the weight of the two fish.

10. Arthur is paid 40 cents an hour for helping his father in the garden. One day he worked from 8 A.M. to 1 P.M. How much did he earn that day?

CHAPTER II

Mt. Rushmore National Monument

The picture shows the world's largest sculptured monument. It is on Mt. Rushmore in the Black Hills of South Dakota. The heads you see are those of Washington, Jefferson, Theodore Roosevelt, and Lincoln.

1. The heads alone are about 60 feet high. How many yards is this? Name some building about 60 feet high.

2. If the whole bodies had been finished, they would have been about 468 feet tall. How many times as much as the height of a man 6 feet tall would this be?

3. The height of the parts of the figures you see is about 210 feet. The height of the Statue of Liberty is about 112 feet. How much less than two times the height of the Statue of Liberty is the height of the Mt. Rushmore monument?

4. The Sphinx of Egypt is 70 feet high. How many times as high are the parts of the figures on Mt. Rushmore?

5. The summit of Mt. Rushmore is 6,200 feet above sea-level. How much more than a mile is this?

★6. Find out about the lives of the men you see in the Mt. Rushmore monument.

Are You Ready for More Advanced Work in Division?

Our new work is to learn how to divide in examples like the one at the right. See if you can find the quotient.

$35\overline{)150}$

1. Before we begin this new work, check again on the Self Helps with division facts on page 332.

2. Next work the first example in each row in the diagnostic test with one-place divisors on page 27. If you make an error in an example, work the whole row of examples.

3. Work also the first example in each row of the diagnostic test on page 32. If you can work them all correctly, you are ready for the new work in division. If you make an error, work the whole row of examples.

4. Multiply mentally. Which part of each pair below is more?

	a	b	c
I	72, or 3×25	82, or 5×17	247, or 4×68
II	86, or 4×21	68, or 4×18	568, or 9×63
III	97, or 2×48	95, or 6×19	380, or 8×38

5. Repeat the diagnostic test in subtraction on page 16.

6. Tell how to check the answer in the example at the right. Is the quotient that is given correct?

$$\begin{array}{r} 3 \text{ r}2 \\ 27\overline{)83} \\ \underline{81} \\ 2 \end{array}$$

$$\begin{array}{r} 5 \\ 20\overline{)132} \\ \underline{100} \\ 32 \end{array}$$

7. What is wrong in the example at the left? How can you tell that the quotient figure is not correct? How can you tell that 7 is not the correct quotient to use? What should the quotient figure be?

Distances by Air

The table below shows the air-line distances in miles between any two of six of the largest cities in the world.

Air-Line Distances (Miles)

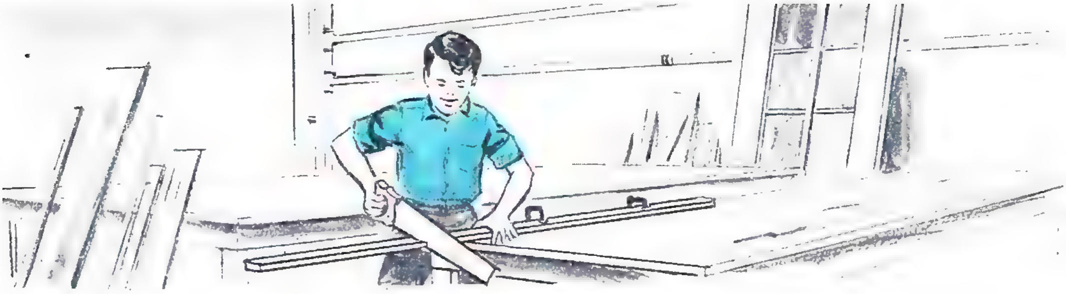
	Bombay	Buenos Aires	London	Moscow	New York	Tokyo
Bombay	....	9380	4526	3131	7875	4247
Buenos Aires	9380	....	6919	8375	5295	11,601
London	4526	6919	....	1549	3500	6050
Moscow	3131	8375	1549	....	4662	4650
New York	7875	5295	3500	4662	....	6846
Tokyo	4247	11,601	6050	4650	6846	....

1. The table shows that it is 9380 miles from Bombay, India, to Buenos Aires. How far is it from Bombay to London? to Moscow? Find the distances in two ways.

2. Which city is nearer to Moscow, New York or Tokyo? How much nearer?

3. Los Angeles is about 2620 air-line miles from New York. How much farther from New York is Moscow? Buenos Aires?

4. Count 10 hours as the flying time from Los Angeles to New York. How many miles an hour does an airplane average in making the trip?



Correcting Estimated Quotients

1. How many 25-inch boards can be cut from a board that is 60 inches long? How much is $60 \div 25$?

$$\text{A.}\ \begin{array}{r} 3 \\ 25\overline{)60} \\ \underline{75} \end{array}$$

Think: $2\overline{)6}$. This is 3. (See A.) We call 3 the **estimated quotient.** $3 \times 25 = 75$.

Because we cannot subtract in A, we know that 3 is **too large a quotient.**

$$\text{B.}\ \begin{array}{r} 2 \\ 25\overline{)60} \\ \underline{50} \\ 10 \end{array}$$

Try the next smaller number than 3, which is 2, as the quotient. (See B.) $2 \times 25 = 50$.

We can subtract 50 from 60. The remainder, 10, is less than the divisor, 25.

So 2 is the correct quotient figure.

2. Which quotient figures below are too large? How can you tell? What are the correct quotient figures?

$$\text{a.}\ \begin{array}{r} 4 \\ 21\overline{)80} \\ \underline{84} \end{array} \qquad \text{b.}\ \begin{array}{r} 4 \\ 26\overline{)93} \\ \underline{104} \end{array} \qquad \text{c.}\ \begin{array}{r} 7 \\ 35\overline{)210} \\ \underline{245} \end{array} \qquad \text{d.}\ \begin{array}{r} 6 \\ 64\overline{)380} \\ \underline{384} \end{array} \qquad \text{e.}\ \begin{array}{r} 3 \\ 46\overline{)139} \\ \underline{138} \end{array}$$

When you cannot subtract, the quotient figure is too large. Try the next smaller figure as the quotient.

3. When you subtract, the **remainder must be less than the divisor.** Why?

4. Estimate the quotient in each example below. Multiply mentally to see if it is too large. Correct the quotient, if necessary, and work the example:

a. $22\overline{)60}$ b. $46\overline{)91}$ c. $33\overline{)122}$ d. $54\overline{)236}$ e. $45\overline{)176}$

Worries of the Grocer

1. Mr. Smith paid $15.00 for 20 pounds of butter. How much did the butter cost a pound?

2. Mr. Smith sold his butter for $.82 a pound. How much more did he receive for a pound than he paid for it?

3. How much more did he receive for the 20 pounds of butter than the butter cost him?

4. Mr. Smith paid $1.44 for 12 loaves of bread and sold the bread for $.16 a loaf. How much more did he receive for the 12 loaves than he paid for them?

5. Mr. Smith paid $7.20 for 24 boxes of berries. How much did he pay a box for the berries?

6. Because it was very hot, 5 boxes of berries spoiled. He sold the other boxes of berries for $.36 a box. How much did he receive for the berries he sold?

7. How much less did he receive for the berries he sold than he paid for the 24 boxes?

★ 8. What must the grocer pay for with the money he receives from the customers?

Everyday Uses of Division

1. Tickets for the school play cost 25 cents. How many can you buy for 80 cents? How many cents will remain?

$$\begin{array}{r} 3 \text{ r5} \\ 25\overline{)80} \\ \underline{75} \\ 5 \end{array}$$

Think: $80 \div 25 = ?$
Why do we not use 4 as the quotient figure?
How can you tell that 3 is the correct quotient?
How many tickets can be bought for 80¢?
How many cents will remain?

MORE PRACTICE 339

2. How many 24-inch ribbons can be cut from a ribbon 80 inches long? How many inches will remain?

Find the quotients:

	a	b	c	d	e
3.	$22\overline{)80}$	$32\overline{)60}$	$44\overline{)81}$	$38\overline{)93}$	$24\overline{)62}$
4.	$12\overline{)30}$	$25\overline{)84}$	$11\overline{)84}$	$29\overline{)43}$	$26\overline{)83}$
5.	$35\overline{)90}$	$42\overline{)86}$	$24\overline{)42}$	$36\overline{)68}$	$13\overline{)31}$
6.	$14\overline{)56}$	$27\overline{)81}$	$33\overline{)64}$	$28\overline{)89}$	$43\overline{)86}$

Practice What You Have Learned

In some of the examples below, the estimated quotient is correct. In others, you must correct the quotient.

	a	b	c	d	e
1.	$21\overline{)60}$	$31\overline{)60}$	$34\overline{)69}$	$41\overline{)81}$	$31\overline{)97}$
2.	$24\overline{)53}$	$46\overline{)97}$	$43\overline{)82}$	$36\overline{)78}$	$25\overline{)83}$
3.	$22\overline{)43}$	$33\overline{)94}$	$64\overline{)130}$	$95\overline{)389}$	$42\overline{)183}$
4.	$21\overline{)90}$	$36\overline{)82}$	$34\overline{)62}$	$23\overline{)67}$	$76\overline{)204}$
5.	$38\overline{)87}$	$12\overline{)45}$	$47\overline{)81}$	$14\overline{)57}$	$45\overline{)82}$
6.	$48\overline{)199}$	$26\overline{)64}$	$22\overline{)65}$	$37\overline{)85}$	$22\overline{)176}$
7.	$16\overline{)48}$	$34\overline{)64}$	$75\overline{)162}$	$15\overline{)30}$	$36\overline{)76}$

Finding More Difficult Quotients

1. How many 25-cent tickets can you buy with 70 cents?

A. $\begin{array}{r} 3 \\ 25\overline{)70} \\ \underline{75} \end{array}$

B. $\begin{array}{r} 2 \\ 25\overline{)70} \\ \underline{50} \\ 20 \end{array}$

How much is $2\overline{)7}$?
Why is 3 too large a quotient figure?
How can you tell from the work in B that 2 is the correct quotient figure?

How many tickets can you buy? How many cents will remain?

2. How many 25-cent tickets can you buy for 90 cents?

	a	b	c	d	e
3.	$24\overline{)71}$	$38\overline{)72}$	$25\overline{)92}$	$49\overline{)92}$	$26\overline{)50}$
4.	$36\overline{)71}$	$27\overline{)74}$	$29\overline{)74}$	$48\overline{)90}$	$25\overline{)73}$

Dividing a Three-Place Number by a Two-Place Number

1. How many rows of 24 plants each can be made with 144 plants?

A. $\begin{array}{r} 7 \\ 24\overline{)144} \\ \underline{168} \end{array}$

B. $\begin{array}{r} 6 \\ 24\overline{)144} \\ \underline{144} \end{array}$

How much is $2\overline{)14}$?
Why must the 7 be written in ones' place?
How can you tell from the work in A that 7 is too large a quotient?

Try 6, the next smaller quotient figure. In B, how can you tell that 6 is the correct quotient?

Copy and divide. Check your work.

	a	b	c	d	e
2.	$24\overline{)102}$	$36\overline{)129}$	$45\overline{)168}$	$74\overline{)497}$	$65\overline{)369}$
3.	$35\overline{)157}$	$42\overline{)163}$	$87\overline{)645}$	$95\overline{)638}$	$23\overline{)123}$
4.	$57\overline{)308}$	$48\overline{)200}$	$68\overline{)364}$	$77\overline{)565}$	$98\overline{)816}$

MORE PRACTICE 339

Dividing More Difficult Three-Place Numbers

1. How many buses are needed for 150 children if 25 children can ride in each bus?

```
       7
A. 25)150
      175

       6
B. 25)150
      150
```

How much is 2)15?

How much is 7 × 25? (See A.) How can you tell that 7 is too large a quotient figure?

Try 6 (1 less than 7) as the quotient.

How can you tell that 6 is the correct quotient figure? (See B.)

How many buses are needed?

Tell how to check the answers.

2. Tell how to find the quotient in each example below.

a	b	c	d
35)162 (4)	58)328 (5)	82)572 (6)	47)263 (5)

MORE PRACTICE 339

Copy and divide. Check your work.

	a	b	c	d	e
3.	25)152	58)340	45)253	64)511	79)647
4.	36)168	87)602	93)377	77)448	27)112
5.	67)518	35)226	98)602	56)437	48)299
6.	85)504	39)111	43)210	73)501	68)374

Practice What You Have Learned

In most of the examples below, the estimated quotient must be corrected. Check your work.

	a	b	c	d	e
1.	44)85	25)178	94)463	40)187	61)480
2.	59)174	32)90	35)213	38)124	85)335
3.	75)648	76)387	68)395	22)136	88)706
4.	99)613	89)476	75)658	98)374	56)448

Buying Tulip Bulbs

Tommy and Mary are helping their father plant tulip bulbs. The list at the right shows the prices at which they can buy the bulbs at the store.

Prices of Tulip Bulbs
10 for 70c
25 for $1.50
50 for $2.00

1. What does 1 bulb cost at the price given for 10 bulbs? for 25 bulbs? for 50 bulbs?

2. In which quantity is the cost of one bulb lowest?

3. How much more would 50 bulbs cost at 10 for 70 cents than at 50 for $2.00?

4. How much less would 50 bulbs cost at 50 for $2.00 than at 25 for $1.50?

5. How much would 20 bulbs cost?

6. How much would 15 bulbs cost?

★ 7. Find the cost of 75 bulbs at 50 for $2.00.

Practice What You Have Learned

	a	b	c	d
1.	$37 \times 846 =$	$50 \times 408 =$	$96 \times 789 =$	$20 \times 2000 =$
2.	$8000 - 5014 =$	$7896 + 8744 =$	$9010 - 405 =$	$48 \times 960 =$
3.	$98\overline{)714}$	$86\overline{)672}$	$77\overline{)284}$	$56\overline{)295}$

How to Save Time When Dividing

1. How long does it take a train to go 240 miles at the rate of 48 miles an hour?

$$48\overline{)240}^{\;6} \qquad 48\overline{)240}^{\;5} \quad \underline{240}$$

Think: $4\overline{)24} = 6$. You can see at a glance that 6 cannot be the correct quotient because 6×40 alone is 240.

So try 5 as the quotient figure.

How can you tell that 5 is the correct quotient?

2. How much is $273 \div 57$?

$57\overline{)273}$

You cannot be sure whether the quotient figure is 5 or 4. First multiply 57 mentally by 5. The product of 5×57 is 285. This is more than 273. So try 4 as the quotient.

Is 4 the correct quotient figure?

You can save much erasing by multiplying mentally to see if the estimated quotient is correct.

Multiply mentally to find which part is larger.

	a	b	c
3.	4×27, or 81	4×58, or 231	3×49, or 150
4.	6×48, or 276	3×24, or 66	9×27, or 240
5.	4×39, or 135	6×27, or 148	7×43, or 281
6.	8×47, or 400	2×28, or 61	5×36, or 177

Multiply mentally before you write the quotient figures.

	a	b	c	d	e
7.	$46\overline{)87}$	$35\overline{)289}$	$35\overline{)211}$	$75\overline{)653}$	$94\overline{)458}$
8.	$36\overline{)125}$	$59\overline{)161}$	$22\overline{)131}$	$61\overline{)485}$	$87\overline{)687}$
9.	$27\overline{)84}$	$48\overline{)275}$	$58\overline{)232}$	$24\overline{)68}$	$49\overline{)151}$
10.	$39\overline{)138}$	$43\overline{)286}$	$67\overline{)527}$	$76\overline{)495}$	$84\overline{)739}$
11.	$68\overline{)590}$	$51\overline{)402}$	$89\overline{)701}$	$93\overline{)826}$	$37\overline{)162}$

Be Careful about These Quotients

1. How many 25-pound bags of sugar can be filled with 225 pounds of sugar? How much is 225 ÷ 25?

$$\begin{array}{r} 9 \\ 25\overline{)225} \\ \underline{225} \end{array}$$

See $25\overline{)22}$ tens. You can see at once that the quotient will have no tens because 22 is less than 25. So you must find how many 25's there are in 225 ones. The quotient must be less than 10 because 10 × 25 = 250. Try 9 as the quotient figure. Is 9 the correct quotient?

How many bags can be filled?

2. Prove that the quotients given below are correct.

a. $\begin{array}{r} 9 \text{ r?} \\ 34\overline{)306} \end{array}$ b. $\begin{array}{r} 9 \text{ r?} \\ 49\overline{)452} \end{array}$ c. $\begin{array}{r} 9 \text{ r?} \\ 24\overline{)226} \end{array}$ d. $\begin{array}{r} 9 \text{ r?} \\ 69\overline{)657} \end{array}$

When the quotient figure seems to be more than 9, try 9.

3. Why is 9 the largest quotient figure that we can use?

4. Which is more: 9 × 37, or 370? How can you tell?

5. Multiply mentally to find which part is larger:

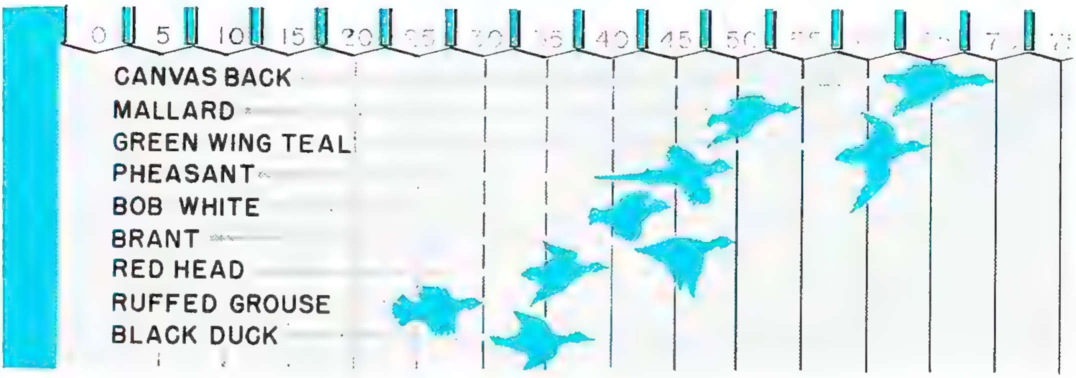
a. 9 × 39, or 360 b. 9 × 45, or 420 c. 9 × 69, or 701

Divide and check your work.

	a	b	c	d	e
6.	$45\overline{)428}$	$24\overline{)216}$	$93\overline{)836}$	$31\overline{)308}$	$56\overline{)529}$
7.	$69\overline{)642}$	$27\overline{)92}$	$49\overline{)463}$	$78\overline{)716}$	$82\overline{)807}$
8.	$33\overline{)304}$	$37\overline{)347}$	$87\overline{)815}$	$97\overline{)655}$	$88\overline{)704}$
9.	$34\overline{)315}$	$94\overline{)463}$	$59\overline{)547}$	$58\overline{)534}$	$68\overline{)629}$
10.	$24\overline{)96}$	$43\overline{)123}$	$98\overline{)402}$	$62\overline{)364}$	$43\overline{)172}$
11.	$81\overline{)724}$	$56\overline{)527}$	$73\overline{)449}$	$39\overline{)374}$	$96\overline{)657}$

MORE PRACTICE

339



How Fast Do Game Birds Fly?

The graph shows how many miles an hour game birds fly.

1. Which of the birds flies most swiftly? Which of the birds has the slowest flight speed?

2. What is the flight speed of a canvasback duck? of a pheasant? of a ruffed grouse? Use the numbers across the top of the graph.

3. Which two game birds have flight speeds of 50 miles an hour?

4. How much greater is the flight speed of the pheasant than of the bob white?

5. How far does a teal fly in 5 hours?

6. How much farther does a canvasback duck fly in 5 hours than a black duck?

7. How long does it take a mallard to fly 550 miles?

8. Which of the game birds has a flight speed of a mile in 2 minutes?

9. Which two birds have a flight speed of more than a mile a minute?

★10. Which of the birds in the graph fly only short distances?

What Are the Correct Quotients?

First give the quotients orally in class, a row at a time. Then, divide on your paper. Take only one set a day.

Sometimes you must correct the quotient figure in these examples, sometimes not. Multiply mentally to check your estimate before you write the quotient figure.

Set I

	a	b	c	d	e
1.	$37\overline{)72}$	$30\overline{)127}$	$26\overline{)51}$	$97\overline{)456}$	$80\overline{)374}$
2.	$76\overline{)423}$	$94\overline{)402}$	$70\overline{)595}$	$35\overline{)133}$	$64\overline{)310}$
3.	$97\overline{)568}$	$11\overline{)45}$	$28\overline{)63}$	$21\overline{)168}$	$95\overline{)926}$
4.	$31\overline{)155}$	$81\overline{)402}$	$21\overline{)81}$	$12\overline{)39}$	$34\overline{)200}$
5.	$43\overline{)410}$	$36\overline{)63}$	$21\overline{)126}$	$86\overline{)339}$	$65\overline{)600}$

Set II

1.	$49\overline{)124}$	$77\overline{)425}$	$93\overline{)813}$	$74\overline{)182}$	$67\overline{)251}$
2.	$42\overline{)90}$	$32\overline{)156}$	$46\overline{)427}$	$95\overline{)918}$	$78\overline{)280}$
3.	$31\overline{)308}$	$46\overline{)130}$	$35\overline{)72}$	$87\overline{)246}$	$53\overline{)513}$
4.	$65\overline{)385}$	$74\overline{)296}$	$67\overline{)628}$	$93\overline{)453}$	$21\overline{)188}$
5.	$32\overline{)283}$	$24\overline{)192}$	$34\overline{)307}$	$55\overline{)262}$	$45\overline{)228}$

Extra Practice for Those Who Need It

1.	$36\overline{)81}$	$26\overline{)76}$	$49\overline{)125}$	$24\overline{)95}$	$47\overline{)463}$
2.	$41\overline{)144}$	$32\overline{)189}$	$38\overline{)85}$	$87\overline{)732}$	$78\overline{)466}$
3.	$36\overline{)189}$	$67\overline{)411}$	$21\overline{)139}$	$37\overline{)72}$	$87\overline{)471}$
4.	$37\overline{)265}$	$77\overline{)306}$	$53\overline{)272}$	$53\overline{)265}$	$48\overline{)239}$
5.	$94\overline{)692}$	$56\overline{)143}$	$26\overline{)248}$	$88\overline{)371}$	$97\overline{)847}$

Correcting Estimated Quotients Two Times

1. A freight train averages 27 miles an hour. How long does it take the train to go 189 miles?

A.
```
     9
27)189
   243
```

How much is 2)18? (See A.)
How do we get 243?
How can you tell that 9 is too large a quotient?

B.
```
     8
27)189
   216
```

Try 8 as the quotient figure. (See B.)
How do we get the 216?
How can you tell that 8 also is too large a quotient?

C.
```
     7
27)189
   189
```

Now try 7 as the quotient figure. (See C.)
How do we get the 189?
How do we know that 7 is the correct quotient?
The train goes 189 miles in 7 hours.

If you cannot subtract, you should try the next smaller quotient figure. Here we had to correct the quotient figure two times.

MORE PRACTICE 340

Find the quotients in the following examples:

	a	b	c	d	e
2.	27)194	28)196	29)175	39)273	26)207
3.	38)304	39)278	49)340	28)199	37)253
4.	28)205	38)304	27)195	29)241	28)194
5.	39)312	26)203	36)302	49)413	25)200

Practice What You Have Learned

	a	b	c	d	e
1.	12)60	28)168	64)618	26)209	78)293
2.	85)602	26)234	37)300	69)370	26)248
3.	49)412	14)84	32)256	35)301	93)914

People Do Not Work So Long Now

The chart at the left tells about the length of the work-week in the United States.

1. How many hours does each clock face represent?

2. How does the chart tell you in which one of the years the work-week was the longest?

3. How many hours long was the work-week in 1850?

4. How many hours less was the work-week in 1900 than in 1850?

5. How many hours less was the work-week in 1950 than in 1850? How many hours less in 1950 than in 1900?

6. For 1940 there are four clock faces and a third of a face. Show that the work-week was about 43 hours that year.

7. Show that according to the chart the work-week in 1960 will be about 37 hours.

8. What has happened to the work-week since 1850?

★ 9. Why do people work fewer hours a week today than in 1850? Why can they produce more in fewer hours?

Correcting Estimated Quotients Three Times

1. How many rows of 28 chairs each can be made with 188 chairs?

```
      6 r20
28)188
   168
    20
```

Think: 188 ÷ 28 = ?

You can see at once that 2)18 or 9 is too large a quotient because 9 × 20 alone is 180.

Try 8 as the quotient. 8 × 28 = ?

8 is too large. Try 7. 7 × 28 = ?

7 is too large. Try 6. 6 × 28 = ?

Why is 6 the correct quotient figure?

We made three corrections to find the true quotient.

MORE PRACTICE 340

Find the quotients in these examples. You will have to correct your estimates several times. Check your answers.

	a	b	c	d	e
2.	29)186	27)186	29)201	39)271	28)182
3.	39)302	28)191	38)226	27)161	29)171
4.	49)291	29)208	28)195	39)300	49)287
5.	12)90	28)167	29)173	14)102	29)203

Practice What You Have Learned

Some of the estimated quotients in the examples below will be correct. Others must be corrected one or more times.

	a	b	c	d	e
1.	28)182	47)436	29)238	86)802	39)272
2.	45)142	38)300	58)403	29)187	64)355
3.	38)164	75)594	27)163	26)209	78)681
4.	49)401	37)149	95)911	59)563	84)600
5.	96)302	69)615	48)199	28)193	97)946

How Much Do Workers Earn?

The blackboard shows the average weekly wages of five groups of workers in a certain city.

1. Which group had the highest weekly wages?

2. How much more did oil workers earn a week than automobile workers?

3. Counting 5 days to the week, how much did shipbuilders earn a day? Which group came nearest to earning $15 a day?

4. How can you tell that all of these workers earned more than $1 an hour? Count 40 hours as a week's work.

5. Counting 40 hours as a week's work, how much did shipbuilders earn an hour?

In round numbers, automobile workers earned $54 a week. $53.71 is nearer to $54 than to $53.

6. Give to the nearest dollar the weekly earnings of coal miners; of oil workers; of shipbuilders.

7. Find how much an hour was earned by automobile workers; by coal miners; by oil workers. Count a week as 40 hours. Use weekly wages expressed to the nearest dollar.

★ 8. What is the difference between salary and wages?

Watch the Quotient Figures

1. A movie theater contains 2784 seats. There are 58 equal rows of seats. How many seats are there in each row?

```
     48
58)2784
   232
    464
    464
```

Think: 2784 ÷ 58 = ?
Is the first estimated quotient 5 or 4?
Why is 4 written in tens' place in the quotient?
How do we get the 8 in the quotient?
How can you tell that 8 is the correct figure?
How many seats are there in each row?

In many of the examples below you must correct the estimated quotient figure. Check your work.

	a	b	c	d	e
2.	58)2623	66)3857	21)816	55)2623	48)1537
3.	65)3859	32)1563	54)1604	87)6024	89)1335
4.	77)4254	49)1245	83)6545	67)6281	65)3445
5.	93)4533	77)4264	46)4270	86)3397	96)3360
6.	74)4481	68)6475	58)2726	97)9164	84)3528

More Practice in Division for Those Who Need It

1.	30)690	23)299	21)483	33)693	41)451
2.	22)506	45)990	34)714	22)308	28)588
3.	36)804	24)579	52)644	33)413	21)301
4.	34)1768	92)3423	45)2393	21)1155	75)3156
5.	93)4876	76)3220	32)1472	64)2240	44)2379
6.	37)11,914	56)8456	34)8586	45)9585	92)19,780

Special Practice in Division

The correct quotient is given in each example. Copy the examples as given and complete the work. The remainder you get should be the one that is given. If it isn't, you can be sure that you have made an error.

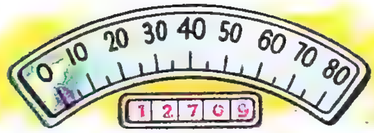
	a	b	c
1.	$\begin{array}{r} 73 \text{ r}8 \\ 23\overline{)1687} \end{array}$	$\begin{array}{r} 83 \text{ r}35 \\ 43\overline{)3604} \end{array}$	$\begin{array}{r} 48 \text{ r}57 \\ 96\overline{)4665} \end{array}$
2.	$\begin{array}{r} 45 \text{ r}3 \\ 58\overline{)2613} \end{array}$	$\begin{array}{r} 37 \text{ r}35 \\ 43\overline{)1626} \end{array}$	$\begin{array}{r} 92 \text{ r}29 \\ 46\overline{)4261} \end{array}$
3.	$\begin{array}{r} 59 \text{ r}17 \\ 65\overline{)3852} \end{array}$	$\begin{array}{r} 36 \text{ r}36 \\ 49\overline{)1800} \end{array}$	$\begin{array}{r} 70 \text{ r}11 \\ 78\overline{)5471} \end{array}$
4.	$\begin{array}{r} 69 \text{ r}40 \\ 87\overline{)6043} \end{array}$	$\begin{array}{r} 94 \text{ r}50 \\ 96\overline{)9074} \end{array}$	$\begin{array}{r} 39 \text{ r}32 \\ 86\overline{)3386} \end{array}$
5.	$\begin{array}{r} 60 \text{ r}31 \\ 74\overline{)4471} \end{array}$	$\begin{array}{r} 506 \text{ r}33 \\ 64\overline{)32{,}417} \end{array}$	$\begin{array}{r} 108 \text{ r}22 \\ 68\overline{)7366} \end{array}$
6.	$\begin{array}{r} 958 \text{ r}32 \\ 85\overline{)81{,}462} \end{array}$	$\begin{array}{r} 360 \text{ r}27 \\ 97\overline{)34{,}947} \end{array}$	$\begin{array}{r} 781 \text{ r}17 \\ 45\overline{)35{,}162} \end{array}$

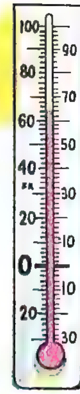
Watch the Zeros

Copy and divide. Check your work.

	a	b	c	d
1.	$35\overline{)10{,}675}$	$26\overline{)1560}$	$84\overline{)34{,}199}$	$48\overline{)2437}$
2.	$27\overline{)823}$	$88\overline{)61{,}634}$	$97\overline{)39{,}285}$	$59\overline{)47{,}236}$
3.	$66\overline{)59{,}928}$	$48\overline{)4323}$	$99\overline{)70{,}092}$	$76\overline{)61{,}497}$

MORE PRACTICE 340





Important Uses of Zero

1. To what number is the hand in the speedometer pointing? We can say that on a speedometer zero is used as a **starting point.**

2. How much below the freezing point is 0°? Which is warmer, 10° above 0° or 10° below 0°? Here zero is a **point above and below which we measure.**

3. At 9 o'clock the temperature was 29°. At 10 o'clock the temperature was still 29°. How many degrees was the change in temperature? (The 0 means **no change.**)

4. What does the final score of the football game shown in the picture mean?

5. Notice the zeros in the numbers on the cash register receipt. You can see that there are four figures in each number. What does the top number on the receipt mean?

6. What does the number $00.08 on the receipt mean?

7. Show that $3.50 is the total of the four upper numbers on the receipt. How is zero used as a **place holder** in writing the sum?

8. Explain how zero is used as a place holder in the answer for each example below.

a. $\begin{array}{r} 873 \\ \underline{-568} \end{array}$ b. $\begin{array}{r} 375 \\ \underline{\times 8} \end{array}$ c. $4\overline{)828}$ d. $23\overline{)1152}$

9. We say that 784 rounded off to the nearest hundred is 800. In what places do we write the zeros? Why?

Finding Quotients with the Teens

What is the quotient when you divide 90 by 18?

18)90 See 1)9. This is 9. How can you tell that 9 is not the correct quotient figure? Is 8 the correct quotient figure? Try the next smaller figure until you find the correct quotient. Why is it not easy to divide by 18?

Let us use the table of 18's at the right to find quotients when we divide by 18.

1	×	18	=	18
2	×	18	=	36
3	×	18	=	54
4	×	18	=	72
5	×	18	=	90
6	×	18	=	108
7	×	18	=	126
8	×	18	=	144
9	×	18	=	162

2. How much is 18)117?

You can see from the table that 117 is between 6 × 18 and 7 × 18. So the quotient must be 6. Divide to see if 18)117 is 6. What is the remainder?

3. Use the table of 18's to find the quotients below. Then divide to see if your figure was correct.

a. 18)43   b. 18)60   c. 18)96   d. 18)140   e. 18)165

4. Make a list of 10 numbers less than 180. Divide each number by 18. Use the table to find the quotients.

5. Make tables of 16's and 17's like the one above for 18's. Then find the quotients below. Use your tables.

	a	b	c	d	e
6.	16)41	16)76	16)101	16)128	16)143
7.	17)52	17)63	17)94	17)118	17)152

★8. When dividing by 19, some people change 19 to 20. See if this plan gives the correct quotient when you divide the following by 19: 39; 46; 80; 117; 153.

Dividing by the Teens

1. Kate has 45 pieces of candy to divide among 15 children. How many pieces should each child receive?

$$\cancel{\begin{array}{r} 4 \\ 15\overline{)45} \\ 60 \end{array}}$$

Think: 45 ÷ 15 = ?
$1\overline{)4}$ is 4, but 4 × 15 = 60. So 4 is too large a quotient figure. Try 3.
How much is 3 × 15?
Each child should receive 3 pieces of candy.

$$\begin{array}{r} 3 \\ 15\overline{)45} \\ \underline{45} \end{array}$$

2. Which of the quotients below are **too large**? Multiply mentally to find out. Next, multiply mentally to see the correct quotient figure. Then, work the examples.

a. $\begin{array}{r} 4 \\ 12\overline{)49} \end{array}$	b. $\begin{array}{r} 4 \\ 13\overline{)43} \end{array}$	c. $\begin{array}{r} 8 \\ 16\overline{)87} \end{array}$	d. $\begin{array}{r} 9 \\ 18\overline{)115} \end{array}$	e. $\begin{array}{r} 9 \\ 19\overline{)174} \end{array}$

3. A quick way that you can use to find 6 × 18 is to think: (6 × 10) 60 + (6 × 8) 48 = 108. Use this method to multiply the numbers below by 6; by 7; by 8; by 9.

12 16 18 14 13 17 15 19

Find the quotients by multiplying mentally.

MORE PRACTICE

	a	b	c	d	e
4.	$12\overline{)72}$	$14\overline{)58}$	$13\overline{)29}$	$12\overline{)95}$	$15\overline{)80}$
5.	$18\overline{)62}$	$15\overline{)120}$	$16\overline{)96}$	$14\overline{)74}$	$13\overline{)85}$
6.	$13\overline{)117}$	$14\overline{)123}$	$12\overline{)110}$	$19\overline{)147}$	$17\overline{)98}$

7. Kate's father told her to change 19 to 20 when dividing by 19. Use this method to divide the following numbers by 19. Does it work?

340 41 68 83 115 132 148 187

341 8. Try dividing the numbers by 18 in the same way. Does it work?

What's Wrong Here?

Tell what is wrong with the quotients in these examples:

1. $\begin{array}{r} 8 \\ 21\overline{)162} \end{array}$ 2. $\begin{array}{r} 4 \\ 36\overline{)143} \end{array}$ 3. $\begin{array}{r} 10 \\ 57\overline{)528} \end{array}$ 4. $\begin{array}{r} 7 \\ 48\overline{)387} \end{array}$

Tell what the errors are in the examples below. Then copy and work the examples correctly. Check your work.

5. $\begin{array}{r} 68 \\ 49\overline{)3375} \\ \underline{296^{\times}} \\ 415 \\ \underline{382} \\ 23 \end{array}$ 6. $\begin{array}{r} 4\ \ 8 \\ 36\overline{)14{,}503} \\ \underline{14\ 2^{\times\times}} \\ 303 \\ \underline{288} \\ 5 \end{array}$ 7. $\begin{array}{r} 8\ \ 5 \\ 27\overline{)21{,}762} \\ \underline{21\ 6^{\times\times}} \\ 162 \\ \underline{135} \\ 26 \end{array}$ 8. $\begin{array}{r} 71 \\ 94\overline{)6477} \\ \underline{658^{\times}} \\ 97 \\ \underline{94} \\ 2 \end{array}$

Special Practice in Multiplication and Subtraction

Copy the examples as given and complete the work.

1. $\begin{array}{r} 37 \text{ r}19 \\ 92\overline{)3423} \end{array}$ $\begin{array}{r} 52 \\ 34\overline{)1768} \end{array}$ $\begin{array}{r} 151 \\ 56\overline{)8456} \end{array}$ $\begin{array}{r} 53 \text{ r}8 \\ 45\overline{)2393} \end{array}$

2. $\begin{array}{r} 73 \text{ r}13 \\ 23\overline{)1692} \end{array}$ $\begin{array}{r} 850 \text{ r}5 \\ 16\overline{)13{,}605} \end{array}$ $\begin{array}{r} 59 \text{ r}22 \\ 65\overline{)3857} \end{array}$ $\begin{array}{r} 39 \text{ r}43 \\ 86\overline{)3397} \end{array}$

3. $\begin{array}{r} 608 \\ 79\overline{)48{,}032} \end{array}$ $\begin{array}{r} 781 \\ 39\overline{)30{,}459} \end{array}$ $\begin{array}{r} 687 \\ 49\overline{)33{,}663} \end{array}$ $\begin{array}{r} 728 \text{ r}9 \\ 18\overline{)13{,}113} \end{array}$

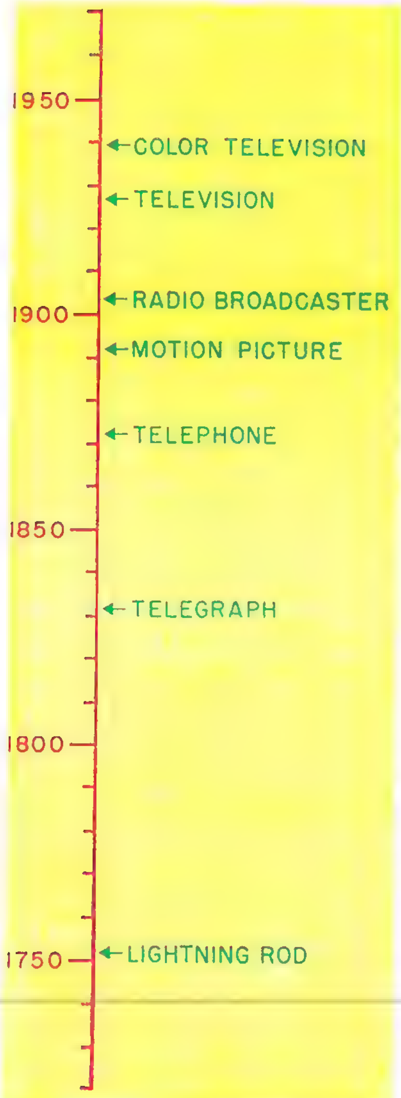
4. Now copy the examples without the answers and divide.

Practice What You Have Learned

	a	b	c	d
1.	$29\overline{)1308}$	$47\overline{)4183}$	$92\overline{)9734}$	$85\overline{)5960}$
2.	$77\overline{)7072}$	$52\overline{)36{,}708}$	$67\overline{)4289}$	$39\overline{)1628}$
3.	$66\overline{)4444}$	$16\overline{)1392}$	$32\overline{)1920}$	$37\overline{)18{,}796}$
4.	$24\overline{)2081}$	$84\overline{)7230}$	$38\overline{)2452}$	$99\overline{)6935}$

MORE PRACTICE

The Magic of Electricity



The drawing at the left is a **time line.** It shows the dates of some wonderful inventions in the field of electricity. The distance between two marks on the line represents ten years.

1. Point to the mark that shows the year 1850; the year 1860; the year 1830.

2. Show that the telegraph was invented a few years after 1830. The exact year was 1832.

3. Which invention was made a few years before 1900? How can you tell?

4. In approximately what year was television invented? the lightning rod? Why can you not tell the exact year?

5. Show that the telephone was invented approximately 40 years later than the telegraph.

6. What was invented approximately 30 years after the motion picture machine?

7. The electric bulb was invented in 1878. What invention shown above was made in approximately the same year?

★8. Draw a time line showing five important events in the history of the United States.

★9. Look up the meaning of "B.C." and "A.D."

"Let's Send a Wire"

John wanted to send a telegram telling his parents when he would arrive. The operator said, "There are 18 words in your message. The charge is $1.40 for your message plus the federal tax." She told John that the regular rate was $1.25 for up to 15 words, and 5 cents for each additional word.

1. Show that the charge for an 18-word message was $1.40, not including the federal tax.

Think: 18 words are 3 more than 15 words. So the charge for 18 words is $1.25 (for 15 words) + 3 × 5¢ (for 3 words) = ?

2. At the same rate, not including the tax, what is the charge for a 17-word telegram? for a 20-word telegram?

3. Find the cost at the same rate, not including the tax, of sending this message: "Best wishes for a very happy birthday. Meet me at the airport Monday afternoon at four."

4. Find the cost, not including the tax, of sending a 17-word telegram. Use the rate of $.96 for 15 words and 4 cents for each additional word.

★5. Find out what the rates on a "night letter" are.

Diagnostic Test in Naming Quotients

How well can you name quotients? Check your work.

	a	b	c	d	
1.	$21\overline{)80}$	$32\overline{)62}$	$43\overline{)87}$	$24\overline{)88}$	(50)
2.	$24\overline{)91}$	$23\overline{)90}$	$37\overline{)71}$	$48\overline{)94}$	(51)
3.	$25\overline{)128}$	$36\overline{)125}$	$58\overline{)159}$	$86\overline{)327}$	(51)
4.	$25\overline{)156}$	$37\overline{)138}$	$67\overline{)378}$	$95\overline{)659}$	(52)
5.	$43\overline{)410}$	$54\overline{)526}$	$65\overline{)611}$	$87\overline{)838}$	(55)
6.	$29\overline{)236}$	$37\overline{)252}$	$27\overline{)190}$	$49\overline{)293}$	(58)
7.	$39\overline{)271}$	$28\overline{)187}$	$38\overline{)225}$	$29\overline{)200}$	(60)
8.	$15\overline{)80}$	$16\overline{)73}$	$18\overline{)94}$	$17\overline{)83}$	(65)
9.	$16\overline{)135}$	$13\overline{)118}$	$19\overline{)147}$	$18\overline{)152}$	(66)

For help, turn to the page at the right of the row.

★ Interesting Things to Look Up

If you have no errors in the diagnostic test, look up information about one of the topics given below.

1. Sales slips used in local stores
2. How to open a charge account
3. Wages paid in building trades
4. Why people are given credit in stores
5. The history of the United States census
6. Record flights by airplanes
7. Measuring devices found in automobiles
8. Everyday uses of division
9. The portraits on our paper money
10. Foreign money

How Well Do You Understand Division?

1. How can you tell that the first quotient figure in the example at the right is not 1? **$56\overline{)5043}$**

2. How can you find what the correct first quotient figure in the example will be? How can you tell where to place it?

3. How many figures will the quotient contain? How can you tell?

4. How can you tell that there will be a remainder in the answer of this example? Work the example and check it.

5. How can you tell when the quotient figure in an example is too small? How can you tell when it is too large?

6. Suppose the remainder is larger than the number by which you are dividing. What does this show about the quotient figure? When the remainder is smaller than the number by which you are dividing, what does this show?

7. How can you tell when to write 0 in the quotient?

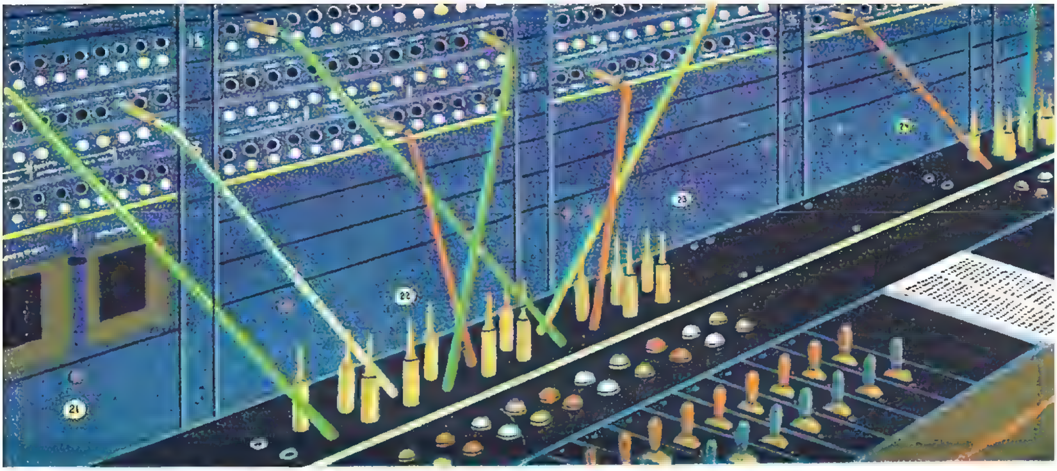
8. What number divided by 18 gives a quotient of 607 and a remainder of 11?

9. In what part of a division example may there be an error in addition? in subtraction? in multiplication?

Test on Division by Two-Place Numbers

If you make no errors, you can be sure that you can divide very well by two-place numbers. Express all remainders with r in the quotient. Check your work.

1. $75\overline{)62,315}$	4. $26\overline{)2376}$	7. $18\overline{)13,410}$	10. $58\overline{)17,864}$
2. $52\overline{)36,708}$	5. $37\overline{)7437}$	8. $96\overline{)77,568}$	11. $16\overline{)640,080}$
3. $84\overline{)8232}$	6. $43\overline{)259,720}$	9. $27\overline{)21,762}$	12. $37\overline{)15,928}$



"Number, Please"

Jane's father told her about the cost of having a telephone. The list below shows the monthly rates for Exchange A which has 7,500 telephones. It also shows the rates for Exchange B with 15,000 telephones. Exchange A is in Smalltown and Exchange B in Largertown.

	Monthly Telephone Rates	
Classes of Service	Exchange A	Exchange B
Individual business line	$7.50	$8.50
Two-party business line	6.75	7.00
Individual residence line	3.50	3.75
Two-party residence line	3.00	3.25
Four-party residence line	2.50	2.75
Rural-business	3.75	4.25
Rural-residence	2.75	2.75

1. What is the monthly rate for an individual business line for Exchange A? for Exchange B?

2. How much more is the monthly cost for an individual business line for Exchange B than for Exchange A? Why is the cost higher for B than for A?

3. How much less a month is a rural business line than an individual business line for Exchange A? for Exchange B?

4. How much more a month is an individual residence line than a two-party residence line for Exchange A? for Exchange B?

5. What is the cost of a four-party line for a year for Exchange A? for Exchange B?

6. Suppose a family has a two-party line instead of an individual residence line. Find the difference in the yearly cost for Exchange A; for Exchange B.

7. In another city, a family pays $2.00 a month for a two-party line. It is allowed 40 outgoing telephone calls. If more calls are made, a charge of 5 cents is made for each additional outgoing call. How much must the family pay for a month in which 52 outgoing calls are made?

Find the costs of the following for one year:

8. Individual business line, Exchange B

9. Individual residence line, Exchange A

10. Two-party residence line, Exchange B

11. Four-party residence line, Exchange A

12. Rural-residence line, Exchange A

13. Suppose a family could subtract 25 cents from the monthly bill if it paid the bill promptly. How much would the family save in a year by prompt payment?

★14. Find out about local telephone rates. What is a "dial phone"?

Quick Thinking in Arithmetic

1. The sum of two numbers is 487. One of the numbers is 298. What is the other number?

2. The difference between two numbers is 124. If the smaller number is 500, what is the larger number?

3. The difference between two numbers is 140. If the smaller number is 320, what is the larger number?

4. The product of two numbers is 96. One of the numbers is 16. What is the other number?

5. What number divided by 28 gives a quotient of 30 and a remainder of 14?

6. What number added to 3 gives the sum 100?

7. What are the two largest three-place numbers whose difference is 300?

8. Write the two three-place numbers whose sum is 201.

9. Writing a 0 after a whole number is the same as multiplying it by what number?

10. Suppose we cross off the 0 in 470. The result is the same as if we divide 470 by what number?

11. Write the smallest whole number possible in which the figure 9 is in thousands' place.

12. Write a fraction, with the numerator 1, that is greater than $\frac{1}{4}$ and less than $\frac{1}{2}$.

Practice What You Have Learned

	a	b	c	d	e
1.	$\frac{1}{4}$ of 87 =	$25\overline{)82}$	$45\overline{)210}$	$58\overline{)349}$	$64\overline{)430}$
2.	$6 \times 208 =$	$17 \times 87 =$	$49 \times 95 =$	$70 \times 2050 =$	$86 \times 970 =$
3.	$\begin{array}{r} 9000 \\ -1605 \\ \hline \end{array}$	$\begin{array}{r} 8010 \\ -2084 \\ \hline \end{array}$	$\begin{array}{r} 9001 \\ -2008 \\ \hline \end{array}$	$\begin{array}{r} 7400 \\ -6070 \\ \hline \end{array}$	$\begin{array}{r} 8000 \\ -7992 \\ \hline \end{array}$

4. Find the sum of \$68.75 + \$9.67 + \$.94 + \$123.60.

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	75	4756	8701	$ 4.39	$ 11.78
	648	812	742	64.74	67.79
	832	5973	8956	9.51	557.83
	7	26	439	.08	7.00
	64	689	9	8.68	36.59
	458	9943	6597	34.96	.52

Practice Test in Subtraction

1.	706	8040	642	$83.14	$68.54
	701	3000	238	82.43	29.61
2.	4196	8216	8047	$90.00	$70.50
	3958	5739	4860	40.05	49.48
3.	9105	6003	$124.20	$137.30	$146.66
	3040	5994	66.86	70.50	59.76

Practice Test in Multiplication

1.	285	796	605	$80.60	$79.68
	6	9	7	8	3
2.	594	796	948	$79.04	$8.54
	10	60	27	84	59

Practice Test in Division

	a	b	c	d
1.	49)3375	69)1237	21)84,063	17)1258
2.	65)32,955	59)4286	89)5340	29)20,387
3.	36)14,503	94)6476	19)7657	82)8020

Quick Thinking in Arithmetic

1. In which example below will the product be largest? In which one will the product be smallest? How can you tell?

a. 38×35	b. 38×10	c. 38×18	d. 38×14	e. 38×26

2. Arrange the above examples in the order of what you think the size of the product will be. Place the example with the smallest product first. Then multiply to see if the order was correct.

3. In which of the following examples will the quotient be largest? How can you tell?

a. $18\overline{)108}$	b. $18\overline{)738}$	c. $18\overline{)180}$	d. $18\overline{)576}$	e. $18\overline{)90}$

4. Arrange the above examples in the order of what you think the size of the quotient will be. Place the example with the largest quotient first. Then divide to see if the order was correct.

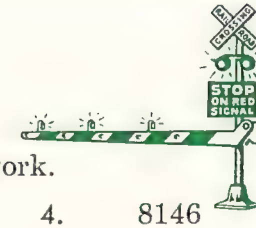
5. Notice that in the examples above, the divisor is the same. The numbers to be divided are different. How can you tell which quotient will be largest? smallest?

---

6. Multiply the two numbers in the example at the right by 10 to make a new division example. Divide the two numbers you get. Is the quotient changed? $7\overline{)56}$

7. Divide the two numbers at the right by 12 to make a new division example. Then divide the numbers you get. Is the quotient changed? $72\overline{)432}$

8. Multiply each number in the example at the right by 2. Find the product of the example you get. Has the product been changed? Why? 8×6



Progress Test II

Copy and work the examples. Check your work.

1. (10) $\begin{array}{r}98\\876\\6\\59\\\underline{9895}\end{array}$

2. (15) $\begin{array}{r}8010\\\underline{-2563}\end{array}$

3. (15) $\begin{array}{r}9005\\\underline{-2689}\end{array}$

4. (15) $\begin{array}{r}8146\\\underline{-7293}\end{array}$

5. (15) $\begin{array}{r}9980\\\underline{-1999}\end{array}$

6. (19) $\begin{array}{r}56\\\underline{\times 10}\end{array}$

7. (19) $\begin{array}{r}87\\\underline{\times 20}\end{array}$

8. (19) $\begin{array}{r}96\\\underline{\times 48}\end{array}$

9. (19) $\begin{array}{r}\$3.79\\\underline{\times 97}\end{array}$

10. (28) $\frac{1}{4}$ of 84 =

11. (31) $32\overline{)749}$

12. (52) $56\overline{)3728}$

13. (24) $8\overline{)7525}$

14. (55) $28\overline{)2613}$

15. (31) $46\overline{)1853}$

16. (58) $28\overline{)1825}$

17. (66) $18\overline{)1638}$

18. (66) $16\overline{)9121}$

19. (24) $4\overline{)197}$

20. (10) \$28.96 + \$8.98 + \$32 + \$6.59 =

For help, turn to the page given below the number of the example.

★For Those with No Work to Correct

Find the missing numbers in the statements below:

1. 8452 + ? = 9168
2. ? + 8147 = 10,000
3. 9000 − ? = 4890
4. ? − 4856 = 2687
5. 8001 − 2846 = ?
6. \$75.68 − ? = \$47.52
7. 14 × 275 = ?
8. ? × 36 = 900
9. 40 × ? = 3600
10. 486 ÷ ? = 9
11. ? ÷ 36 = 58
12. 586 ÷ 18 = ?
13. What number is 3 more than half of 12?
14. What number is 4 more than 8 × 76?
15. What number is 2 less than one fourth of 32?
16. How much is 9 × 12345679?

Test in Problem Solving II

1. At a sale Alice bought a $5 storybook doll for $3.75. How much did she save?

2. If potatoes sell for 10 pounds for 35 cents, how much is that a pound?

3. What is the cost of $\frac{1}{4}$ pound of butter at $.96 a pound?

4. For a school picnic each child paid 20 cents for lunch and 18 cents for carfare. How much did the 36 children pay?

5. The total weight of a shipment of 20 hogs was 4680 pounds. What was their average weight?

6. On three tests in problem solving Tom's scores were 9, 8, and 10. What was his average score?

7. At the rate of 4 bars for 10 cents how much do 20 candy bars cost?

8. Bob wants to buy a $10 baseball mitt. He has saved $3.96 and then earns $1.25. How much more money does he need before he can buy the mitt?

9. Ann bought $\frac{1}{2}$ yard of blue ribbon and $\frac{1}{4}$ yard of red ribbon, both at 40 cents a yard. How much change did she receive from a dollar?

10. A train that is due at 12:38 is 40 minutes late. At what time is the train expected to arrive?

How many problems did you work correctly?

CHAPTER III

We Use Fractions in Many Ways

1. A pie is cut into four equal parts. What is the name of each of the four parts?

2. Tell how much $\frac{3}{4}$ of a pie is. What does the $\overline{4}$ in this fraction show? What does the $\underline{3}$ show?

3. When we say that it is half past ten, how many minutes after 10 o'clock is it?

4. Tell what part of an hour 15 minutes is.

5. Use a ruler to find how many eighths of an inch there are in $\frac{1}{2}$ inch; in $\frac{3}{4}$ inch.

6. Use the picture of the ruler to tell which is most: $\frac{7}{16}$ inch, $\frac{1}{2}$ inch, or $\frac{5}{8}$ inch. Which is least?

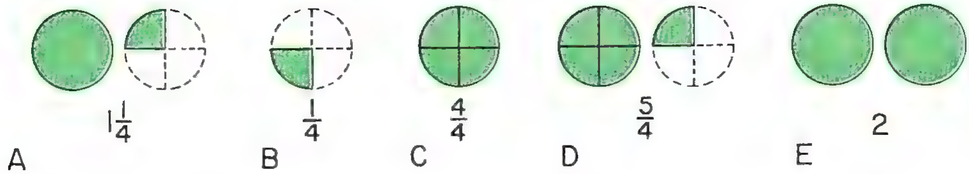
7. What fractional part of a gallon is one quart? How do you suppose the quart received its name?

8. How many cents are there in a quarter of a dollar?

9. Alice cut a ribbon 5 yards long into 4 equal pieces. How long was each piece?

10. Half of the 36 children in a class are members of the Junior Red Cross. How many are members?

★11. Tell about other ways in which we use fractions.



The Vocabulary of Common Fractions

1. Tell which of the above drawings shows:

   a. A proper fraction c. A mixed number

   b. A whole number d. An improper fraction

2. What is the numerator of the fraction $\frac{1}{4}$? What is the denominator? We call the numerator and the denominator of a fraction its **terms.**

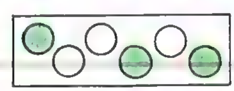
3. Which of the fractions $\frac{2}{4}$, $\frac{3}{4}$, and $\frac{3}{8}$ are reduced to lowest terms? How can you tell?

4. Tell which of the drawings above shows an improper fraction which is equal to 1; greater than 1.

Different Uses of Fractions

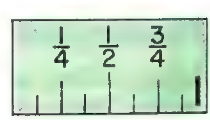
1. What part of the circle is green?

2. How many apples are $\frac{1}{2}$ of the apples shown in the drawing? $\frac{1}{2}$ of 8 = ?



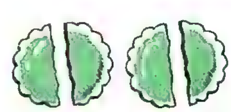
3. What part of the circles in the box are colored green? 3 is what part of 6?

4. Tell how 2 children can share the 3 cookies shown on the plate. $2\overline{)3}$ = ?



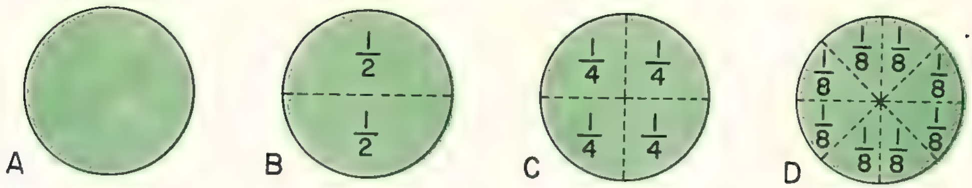
5. Use the piece of ruler to tell how many $\frac{1}{8}$ inches there are in $\frac{3}{4}$ inch.

6. What coins have fractions as names?



★7. If 4 children are to share 2 cookies, how many should each one receive?

$2 \div 4 = ?$ $4\overline{)2} = ?$ $\frac{2}{4} = ?$



Using Cut-Outs to Learn about Common Fractions

1. Cut out 14 equal circles about the size of the bottom of a small can.

2. Fold 4 circles into halves as in B, 4 into quarters as in C, and 2 into eighths as in D. Label each part of each circle. Then cut them into parts along the folds. Put these parts and the four whole circles in an envelope.

3. Lay half circles in two of your whole circles. How many half circles make 2 whole circles? $2 = \frac{?}{2}$.

4. Use your half circles to find how many half circles there are in $1\frac{1}{2}$ circles; in $2\frac{1}{2}$ circles?

5. Use your quarter circles. How many quarter circles are there in 2 circles? in $1\frac{1}{4}$ circles? in $1\frac{1}{2}$ circles? in $1\frac{3}{4}$ circles? in 6 of the eighth circles? $\frac{6}{8} = \frac{?}{4}$.

6. Use your eighth circles to find how many eighths there are in 2; in $\frac{1}{2}$; in $1\frac{1}{8}$; in $\frac{3}{4}$; in $1\frac{3}{8}$; in $1\frac{7}{8}$.

7. Lay 2 of the quarter circles together on a whole circle. How many half circles are needed to cover them? $\frac{2}{4} = \frac{?}{2}$.

8. Lay four of the eighth circles on a whole circle. How many half circles are needed to cover them? How many quarter circles?

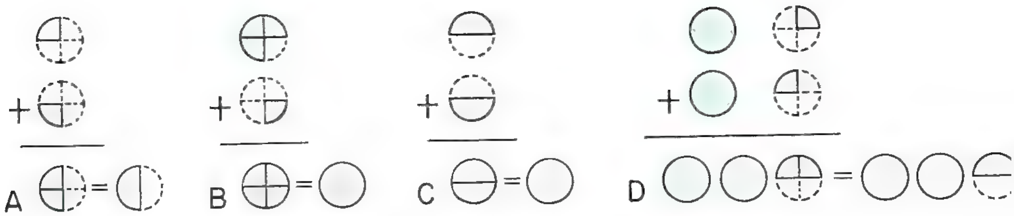
9. Use your cut-outs to find which is most: $\frac{3}{2}$, $\frac{3}{4}$, or $\frac{3}{8}$.

10. Use your cut-outs to find which is most: $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$.

11. Use your cut-outs to find $\frac{1}{2} + \frac{1}{4}$; $\frac{1}{2} + \frac{3}{4}$.

12. Use your cut-outs to find $\frac{1}{2} - \frac{1}{8}$; $\frac{3}{4} - \frac{1}{2}$.

13. Use your cut-outs to find which is more, $\frac{3}{4}$ or $\frac{7}{8}$.



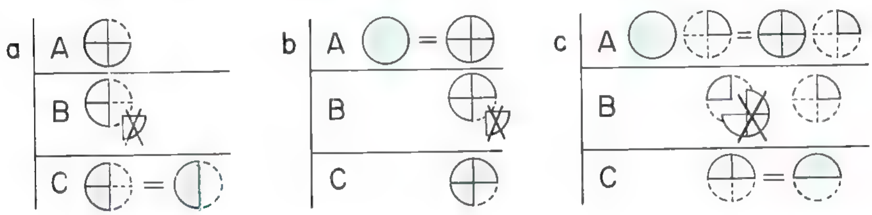
Drawings Tell Fraction Stories

1. The drawings in A tell the story, $\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$. Use your cut-outs also to picture the story.

2. Which of the drawings tells the story $\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$? Tell the story with your cut-outs.

3. Tell the stories in B and D. Show them with cut-outs.

4. Which of the drawings below tells the story, $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$?



5. Use cut-outs to prove that $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$.

6. Explain the steps in subtracting $1 - \frac{1}{4}$, shown in b. Show the steps with your cut-outs.

7. Explain the steps in subtracting $1\frac{1}{4} - \frac{3}{4}$, shown in c. Show the steps with your cut-outs.

★8. Use cut-outs to find $2 - \frac{1}{2}$; $3 - 1\frac{1}{4}$; $1\frac{1}{4} - \frac{2}{4}$.

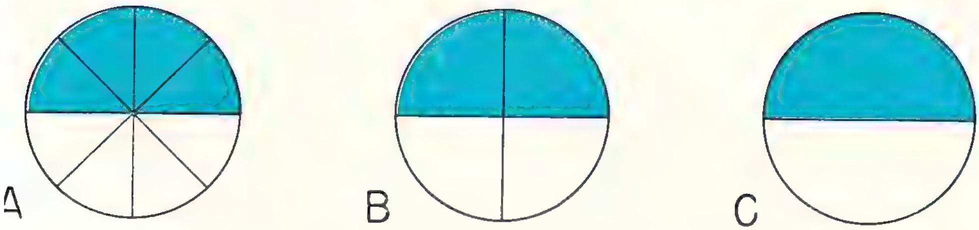
Using a Ruler to Compare Fractions

1. How long is this piece of ruler?

2. How many $\frac{1}{2}$ inches are there in 1 whole inch? in $1\frac{1}{2}$ inches? Use the ruler to find out.

3. How many $\frac{1}{4}$ inches are there in $\frac{1}{2}$ inch? in $\frac{3}{4}$ inch? in $1\frac{1}{4}$ inches? in $1\frac{1}{2}$ inches? in $1\frac{3}{4}$ inches?

4. Use the ruler to find how much $\frac{3}{4} + \frac{1}{4}$ is.



Reducing Fractions to Lowest Terms

1. Which of the circles is divided into the smallest parts?

2. Prove that half of circle A is blue. You can see that $\frac{4}{8} = \frac{1}{2}$. When we change $\frac{4}{8}$ to $\frac{1}{2}$, we have a fraction with fewer parts, but the parts are larger. C shows this.

3. Use B and C to prove that $\frac{2}{4} = \frac{1}{2}$. Prove that in $\frac{2}{4}$ there are more parts and smaller parts than in $\frac{1}{2}$.

$$\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$$

This work shows that $\frac{4}{8}$, $\frac{2}{4}$, and $\frac{1}{2}$ are all equal. Answers to examples should always be expressed with the smallest numbers possible. You can see that $\frac{1}{2}$ is simpler than either $\frac{4}{8}$ or $\frac{2}{4}$. We can say that $\frac{1}{2}$ is **reduced to lowest terms.** Its terms (numerator and denominator) cannot be divided by any other whole number but the number 1. Why cannot $\frac{3}{5}$ be reduced?

4. Here is an easy way to reduce $\frac{4}{8}$ to lowest terms. By what number are both terms divided? What drawings prove that $\frac{4}{8} = \frac{1}{2}$?

$$\frac{4}{8} = \frac{4 \div 4}{8 \div 4} = \frac{1}{2}$$

5. By what number can we divide both terms of $\frac{2}{4}$ to change $\frac{2}{4}$ to $\frac{1}{2}$?

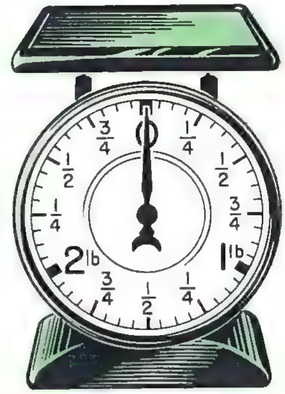
$$\frac{2}{4} = \frac{2 \div ?}{4 \div ?} = \frac{1}{2}$$

Dividing both terms of a fraction by the same number gives us another fraction having the same value.

6. Make drawings like the square at the right. Shade $\frac{8}{16}$ to show that $\frac{8}{16} = \frac{1}{2}$. Show that $\frac{4}{16} = \frac{1}{4}$; that $\frac{12}{16} = \frac{3}{4}$. How do we reduce $\frac{8}{16}$ to $\frac{1}{2}$? $\frac{4}{16}$ to $\frac{1}{4}$? $\frac{12}{16}$ to $\frac{3}{4}$?

MORE PRACTICE 342

Changing Small Measures to Larger Measures



The scales in the drawing at the right weighs by the ounce. Why is there a 0 on the scales?

1. Begin at 0 and count the marks there are to the $\frac{1}{4}$-pound mark. How many ounces are there in $\frac{1}{4}$ pound?

2. How many ounces does the drawing show that there are in $\frac{1}{2}$ pound? in $\frac{3}{4}$ pound? in 1 pound?

3. What part of a pound is 1 ounce?
   Think: 16 ounces = 1 pound. So 1 ounce = $\frac{1}{16}$ pound.

4. You see that 4 ounces is $\frac{4}{16}$ pound. How much is $\frac{4}{16}$ reduced to lowest terms?

5. Show that 8 ounces is $\frac{8}{16}$ pound. What fraction is $\frac{8}{16}$ when reduced to lowest terms? Check with the drawing.

6. Show that 12 ounces or $\frac{12}{16}$ pound is $\frac{3}{4}$ pound.

7. What fraction of a pound is 2 ounces? 6 ounces?

Finding Parts of Measures

1. What part of an hour is 20 minutes?
   Think: 1 min. = $\frac{1}{60}$ hr. So 20 min. = $\frac{20}{60}$ hr. = ?

2. What part of an hour is 10 minutes? 15 minutes? 30 minutes?

3. What part of a foot is 6 inches? 8 inches? 4 inches?

4. What part of a yard is 9 inches? 18 inches? 24 inches?

5. What part of a gallon is 1 quart? 1 pint?

6. What part of a day is 8 hours? 12 hours? 20 hours?

★7. What part of a ton is 500 pounds?

★8. What part of a mile is 440 yards?

Reducing Fractions in Quotients

1. A 50-pound bag of potatoes was on sale for \$1.75. What was the price of the potatoes a pound?

$$\begin{array}{r} \$\ .03\frac{25}{50} = \$.03\frac{1}{2} \\ 50\overline{)\$1.75} \\ 1\ 50 \\ \hline 25 \end{array}$$

Think: \$1.75 ÷ 50 = ?
How do we get the 3?
Remember that $\frac{25}{50}$ is the same as $50\overline{)25}$.
How do we change $\frac{25}{50}$ to $\frac{1}{2}$?

What was the price a pound?

2. A 40-pound box of apples was sold for \$2.25. What was the price a pound?

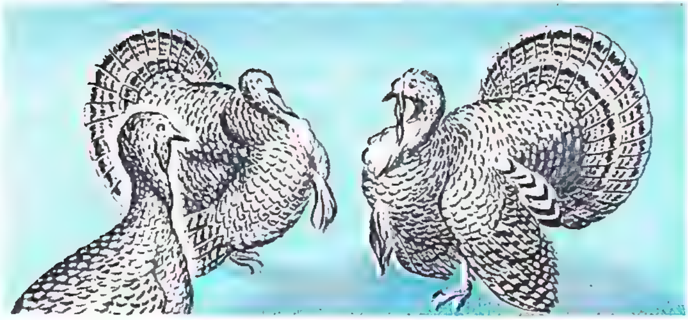
3. Corn costs 16 cents a can. How many cans of corn can you buy at the store for 50 cents? How many cents will remain? Why can the answer not be $3\frac{1}{8}$ cans?

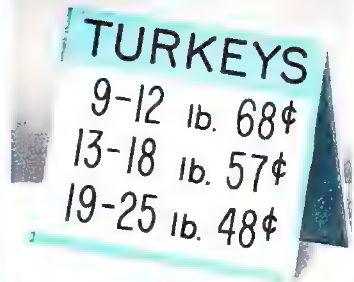
Reduce the fractions in the quotients to lowest terms:

	a	b	c	d	e
4.	$12\overline{)606}$	$20\overline{)845}$	$14\overline{)707}$	$10\overline{)115}$	$16\overline{)652}$
5.	$36\overline{)2862}$	$18\overline{)2187}$	$24\overline{)1884}$	$12\overline{)1110}$	$32\overline{)2192}$
6.	$30\overline{)1275}$	$48\overline{)4000}$	$15\overline{)1240}$	$17\overline{)1493}$	$14\overline{)1141}$
7.	$16\overline{)1720}$	$12\overline{)800}$	$60\overline{)49{,}050}$	$16\overline{)1492}$	$40\overline{)3610}$
8.	$19\overline{)3728}$	$80\overline{)7240}$	$36\overline{)3057}$	$18\overline{)837}$	$36\overline{)2826}$
9.	$28\overline{)5238}$	$13\overline{)1137}$	$19\overline{)4825}$	$24\overline{)1860}$	$12\overline{)1000}$
10.	$50\overline{)\$37.75}$	$40\overline{)\$1.80}$	$10\overline{)\$16.25}$	$16\overline{)\$12.84}$	$60\overline{)\$69.45}$

★ 11. An airplane flies 126 miles in 36 minutes. How many miles is that on the average a minute?

★ 12. An airplane flies 100 miles in 25 minutes. How long does it take to fly 1 mile?





Turkeys for Thanksgiving

1. How much did a 12-pound turkey cost a pound?

2. How much did a 15-pound turkey cost a pound?

3. How much less a pound did a 15-pound turkey cost than an 11-pound turkey?

4. How much did a 10-pound turkey cost?

5. How much did a 20-pound turkey cost?

6. How much more did two 10-pound turkeys cost than one 20-pound turkey?

7. A farmer sold 450 turkeys. Their average weight was 14 pounds. How much did he receive for the turkeys at 26 cents a pound?

★8. Why does the farmer receive less a pound for turkeys than the price charged at the meat market?

Practice What You Have Learned

	a	b	c	d	e
1.	8003 −6208	374 ×40	29)643	608 ×37	86)8072
2.	16)1296	568 ×95	\$96.04 −87.26	48)43,488	\$7.49 ×89

3. \$7.96 + \$87.93 + \$.15 + \$364.58 =

Diagnostic Test in Like Fractions

Copy the following examples, a row at a time, and work them. If you have more than one example incorrect in the row, study carefully the page given at the right.

Reduction of Fractions

1. Reduce to lowest terms: $\frac{4}{8}$; $\frac{6}{8}$; $5\frac{2}{4}$; $7\frac{5}{10}$. (82)

2. Express in simplest form: $\frac{2}{2}$; $\frac{5}{3}$; $\frac{6}{4}$; $7\frac{4}{4}$; $8\frac{6}{4}$. (89)

3. Supply the missing numbers:

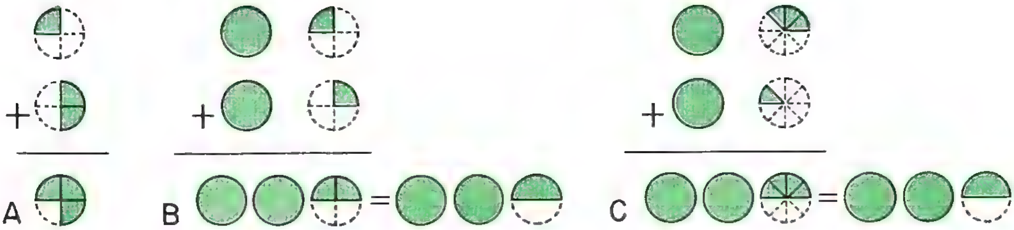
$3 = 2\frac{?}{2}$ $\quad 1 = \frac{?}{4}$ $\quad 1\frac{3}{8} = \frac{?}{8}$ $\quad 5\frac{1}{4} = 4\frac{?}{4}$ (94)

Addition

	a	b	c	
1.	$\begin{array}{r}\frac{1}{3}\\ \underline{\frac{1}{3}}\end{array}$	$\begin{array}{r}\frac{1}{4}\\ \underline{\frac{1}{4}}\end{array}$	$\begin{array}{r}\frac{3}{8}\\ \underline{\frac{3}{8}}\end{array}$	(88)
2.	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{2}{3}}\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{3}{4}}\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \underline{\frac{3}{6}}\end{array}$	(91)
3.	$\begin{array}{r}\frac{1}{2}\\ \underline{\frac{1}{2}}\end{array}$	$\begin{array}{r}\frac{1}{4}\\ \underline{\frac{3}{4}}\end{array}$	$\begin{array}{r}\frac{5}{8}\\ \underline{\frac{3}{8}}\end{array}$	(91)
4.	$\begin{array}{r}2\frac{1}{4}\\ \underline{3\frac{1}{4}}\end{array}$	$\begin{array}{r}7\frac{1}{8}\\ \underline{4\frac{3}{8}}\end{array}$	$\begin{array}{r}6\frac{1}{6}\\ \underline{4\frac{1}{6}}\end{array}$	(88)
5.	$\begin{array}{r}6\frac{1}{2}\\ \underline{4\frac{1}{2}}\end{array}$	$\begin{array}{r}8\frac{1}{4}\\ \underline{7\frac{3}{4}}\end{array}$	$\begin{array}{r}4\frac{7}{10}\\ \underline{8\frac{3}{10}}\end{array}$	(91)
6.	$\begin{array}{r}8\frac{3}{4}\\ \underline{7\frac{3}{4}}\end{array}$	$\begin{array}{r}9\frac{2}{3}\\ \underline{8\frac{2}{3}}\end{array}$	$\begin{array}{r}6\frac{7}{8}\\ \underline{4\frac{5}{8}}\end{array}$	(91)

Subtraction

1.	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{1}{4}}\end{array}$	$\begin{array}{r}\frac{7}{8}\\ \underline{\frac{3}{8}}\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \underline{\frac{1}{6}}\end{array}$	(93)
2.	$\begin{array}{r}\frac{1}{4}\\ \underline{\frac{1}{4}}\end{array}$	$\begin{array}{r}\frac{1}{3}\\ \underline{\frac{1}{3}}\end{array}$	$\begin{array}{r}2\frac{1}{2}\\ \underline{1\frac{1}{2}}\end{array}$	(93)
3.	$\begin{array}{r}5\frac{5}{8}\\ \underline{4\frac{1}{8}}\end{array}$	$\begin{array}{r}7\frac{2}{3}\\ \underline{6\frac{1}{3}}\end{array}$	$\begin{array}{r}5\frac{5}{8}\\ \underline{4\frac{3}{8}}\end{array}$	(93)
4.	$\begin{array}{r}1\\ \underline{\frac{1}{4}}\end{array}$	$\begin{array}{r}1\\ \underline{\frac{3}{8}}\end{array}$	$\begin{array}{r}1\\ \underline{\frac{5}{6}}\end{array}$	(94)
5.	$\begin{array}{r}3\\ \underline{1\frac{3}{4}}\end{array}$	$\begin{array}{r}4\\ \underline{2\frac{3}{8}}\end{array}$	$\begin{array}{r}7\\ \underline{6\frac{1}{2}}\end{array}$	(94)
6.	$\begin{array}{r}1\frac{1}{4}\\ \underline{\frac{3}{4}}\end{array}$	$\begin{array}{r}5\frac{1}{3}\\ \underline{2\frac{2}{3}}\end{array}$	$\begin{array}{r}6\frac{3}{8}\\ \underline{5\frac{7}{8}}\end{array}$	(95)



Important Points about Addition of Like Fractions

Use the drawings above and your cut-outs to review what we have studied about the addition of like fractions.

1. Use A to explain the steps in adding $\frac{1}{4} + \frac{2}{4}$.

$$\begin{array}{r} \frac{1}{4} \\ +\frac{2}{4} \\ \hline \frac{3}{4} \end{array}$$

Why can we say that $\frac{1}{4}$ and $\frac{2}{4}$ are like fractions?

How do we get the $\frac{3}{4}$?

Why can we not reduce $\frac{3}{4}$ to a simpler fraction?

2. Use B to explain the steps in adding $1\frac{1}{4} + 1\frac{1}{4}$.

$$\begin{array}{r} 1\frac{1}{4} \\ +1\frac{1}{4} \\ \hline 2\frac{2}{4} \end{array} = 2\frac{1}{2}$$

First add the fractions; then add the whole numbers.

How do we get the $\frac{2}{4}$ in the sum? the 2?

Why do we change $2\frac{2}{4}$ to $2\frac{1}{2}$? How?

3. Use C to explain the steps in adding $1\frac{3}{8} + 1\frac{1}{8}$.

$$\begin{array}{r} 1\frac{3}{8} \\ +1\frac{1}{8} \\ \hline 2\frac{4}{8} \end{array} = 2\frac{1}{2}$$

How do we get the $\frac{4}{8}$ in the sum? the 2?

How do we change $2\frac{4}{8}$ to $2\frac{1}{2}$?

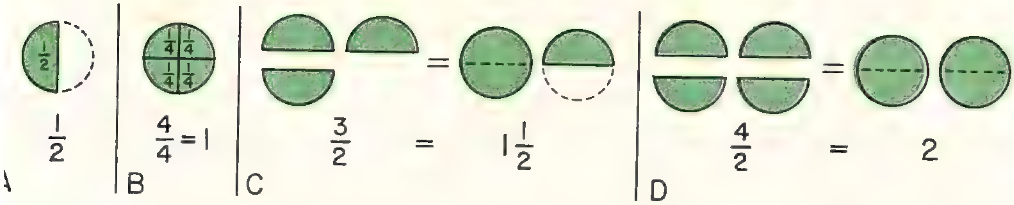
Why can we not change $2\frac{1}{2}$ to a simpler number?

MORE PRACTICE 342

4. Copy the three examples and add. Check your work.

Add. Reduce fractions in the sums to lowest terms.

	a	b	c	d	e	f	g
5.	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{1}{8}$ $\frac{3}{8}$	$\frac{2}{5}$ $\frac{2}{5}$	$\frac{4}{8}$ $\frac{1}{8}$	$\frac{1}{6}$ $\frac{3}{6}$	$\frac{3}{10}$ $\frac{5}{10}$
6.	$5\frac{1}{8}$ $3\frac{1}{8}$	$4\frac{1}{3}$ $3\frac{1}{3}$	$5\frac{3}{5}$ $4\frac{1}{5}$	$5\frac{1}{4}$ $6\frac{1}{4}$	$7\frac{3}{10}$ $4\frac{1}{10}$	$5\frac{3}{8}$ $4\frac{3}{8}$	$9\frac{7}{12}$ $6\frac{3}{12}$



Fractions Equal to One or More than One

A and B show that the fractions $\frac{1}{2}$ and $\frac{1}{4}$ are both less than one whole. We call them **proper fractions.**

1. Use B to prove that the fraction $\frac{4}{4}$ is equal to 1.

2. Use C to prove that the fraction $\frac{3}{2}$ is equal to more than one whole. How many halves make a whole? How much more than $\frac{2}{2}$ are $\frac{3}{2}$?

3. Use D to prove that $\frac{4}{2}$ equals 2 wholes.

Fractions like $\frac{4}{4}$, $\frac{3}{2}$, and $\frac{4}{2}$ are equal to 1 or more than 1. They are called **improper fractions.** Their numerators are equal to or larger than their denominators.

4. Name the improper fractions below.

$\frac{2}{2}$ $\quad \frac{2}{4}$ $\quad \frac{4}{6}$ $\quad \frac{3}{3}$ $\quad \frac{6}{4}$ $\quad \frac{5}{5}$ $\quad \frac{3}{2}$ $\quad \frac{4}{4}$ $\quad \frac{7}{4}$ $\quad \frac{6}{2}$

5. How many quarter pieces of pie do you see at the right? How many pies are there in all?

You can see that $\frac{6}{4}$ pies $= \frac{4}{4}$ pie (1 pie) and $\frac{2}{4}$ pie, or $1\frac{1}{2}$ pies.

A quick way to change $\frac{6}{4}$ to $1\frac{1}{2}$ is shown at the right. Divide 6 by 4. You get $1\frac{1}{2}$.

$$\begin{array}{r} 1\frac{2}{4} = 1\frac{1}{2} \\ 4\overline{)6} \quad \\ \underline{4} \quad \\ 2 \quad \end{array}$$

6. Use this method to prove that $\frac{3}{2} = 1\frac{1}{2}$; that $\frac{4}{2} = 2$.

7. Prove that $1\frac{2}{2} = 2$; that $1\frac{3}{2} = 2\frac{1}{2}$.

Express the numbers below in simplest form.

8. $\frac{3}{3}$ $\quad \frac{4}{3}$ $\quad \frac{6}{3}$ $\quad \frac{5}{4}$ $\quad \frac{2}{2}$ $\quad \frac{9}{8}$ $\quad \frac{12}{8}$ $\quad \frac{6}{4}$ $\quad \frac{10}{5}$

9. $2\frac{2}{2}$ $\quad 3\frac{3}{4}$ $\quad 5\frac{3}{3}$ $\quad 1\frac{5}{4}$ $\quad 2\frac{3}{2}$ $\quad 6\frac{7}{4}$ $\quad 3\frac{8}{4}$ $\quad 5\frac{4}{2}$ $\quad 7\frac{8}{6}$

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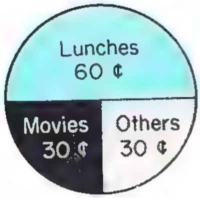
Circles Tell Stories



1. The circle at the left shows how Bobby spent his allowance one week. How much was his total allowance? How much did he spend for lunches and movies?

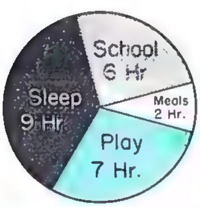
We call this picture a **circle graph.**

2. The whole circle stands for all of his allowance. What fractional part of the circle stands for the amount he spent for lunches. Show that 60 cents is half of his total allowance.

3. What part of the whole circle stands for the amount he spent for movies? Is 30 cents $\frac{1}{4}$ of his allowance?

4. How does the graph show that he spent the same amounts for movies and for other expenses?

5. How does the graph show that he spent as much for movies and other expenses as for lunches?



6. This circle graph shows how Mary spends the hours of a school day. How many hours are shown?

7. What fraction of a day, according to the graph, is Mary at school?

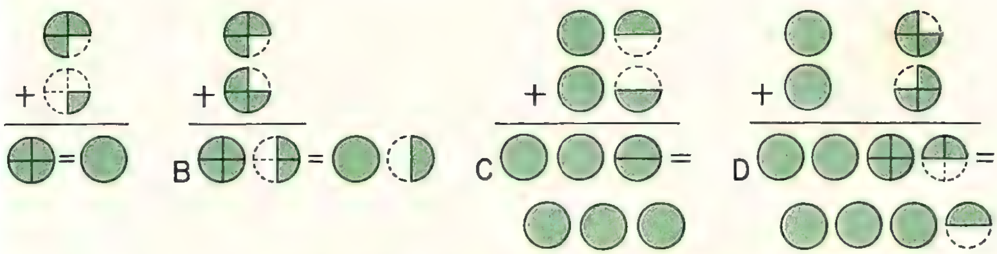
8. What fraction of a day does she sleep?

9. What fraction of a day does Mary play?

10. What fraction of a day does Mary spend at play and at meals?

11. What fractional part of a day does Mary spend at school and at play?

★ 12. See if you can find examples of circle graphs in books and newspapers. Be ready to tell about them.



Improper Fractions in the Sum

Use the drawings above to see how to add fractions whose sums contain improper fractions.

1. Use A or your cut-outs to find $\frac{3}{4} + \frac{1}{4}$.

$$\begin{array}{r} \frac{3}{4} \\ +\frac{1}{4} \\ \hline \frac{4}{4} = 1 \end{array}$$

How do we find the $\frac{4}{4}$ in the sum?
How many fourths are there in one whole?
Why do we change $\frac{4}{4}$ to 1?

2. Use B or your cut-outs to find $\frac{3}{4} + \frac{3}{4}$.

$$\begin{array}{r} \frac{3}{4} \\ +\frac{3}{4} \\ \hline \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2} \end{array}$$

How do we find the $\frac{6}{4}$ in the sum?
Explain why $\frac{6}{4} = 1\frac{2}{4}$.
Why do we change $1\frac{2}{4}$ to $1\frac{1}{2}$? How?

3. Use C or your cut-outs to find $1\frac{1}{2} + 1\frac{1}{2}$.

$$\begin{array}{r} 1\frac{1}{2} \\ +1\frac{1}{2} \\ \hline 2\frac{2}{2} = 2 + 1 = 3 \end{array}$$

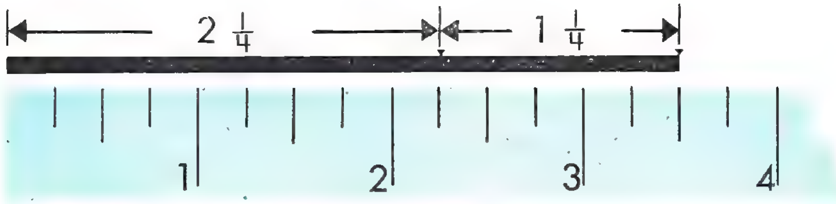
How do we find the $\frac{2}{2}$ in the sum?
Explain why $\frac{2}{2} = 1$.
How do we change $2\frac{2}{2}$ to 3?

4. Use D to find $1\frac{3}{4} + 1\frac{3}{4}$. Check with your cut-outs.
5. Now copy and work the four examples given above.
6. Express in simplest form: $\frac{3}{3}$; $\frac{5}{3}$; $\frac{6}{4}$; $7\frac{2}{2}$; $8\frac{4}{4}$; $8\frac{10}{8}$; $7\frac{9}{6}$.

Add. Express all sums in simplest form.

	a	b	c	d	e	f	g
7.	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{5}$
	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{4}{5}$
8.	$6\frac{1}{2}$	$6\frac{3}{4}$	$7\frac{1}{4}$	$7\frac{2}{3}$	$8\frac{5}{6}$	$6\frac{5}{8}$	$8\frac{7}{8}$
	$7\frac{1}{2}$	$5\frac{3}{4}$	$8\frac{3}{4}$	$6\frac{1}{3}$	$9\frac{5}{6}$	$7\frac{3}{8}$	$6\frac{7}{8}$

MORE PRACTICE 342



Using a Ruler to Check Addition of Fractions

The line above has two parts. The length of each part is given. You can find the total length by adding the mixed numbers. You can also use the ruler to find its length.

$$\begin{array}{r} 2\frac{1}{4} \\ +1\frac{1}{4} \\ \hline ? \end{array}$$

1. Find the length of the line by adding the lengths of the two parts.

2. Find the length of the two parts by using the ruler.

3. Find the length of each of the whole lines below by adding the parts shown. Check your answer by measuring the whole line with a ruler.

a. $1\frac{3}{8}''$ | $2\frac{1}{8}''$

b. $\frac{7}{8}''$ | $\frac{7}{8}''$

d. $\frac{3}{4}''$ | $\frac{3}{4}''$

c. $1\frac{1}{4}''$ | $\frac{3}{4}''$

e. $\frac{5}{8}''$ | $\frac{7}{8}''$

Draw lines to find the sums. Check by addition.

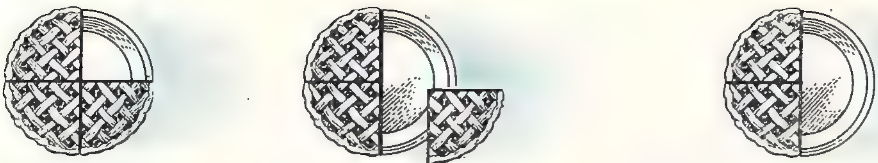
4. $1\frac{1}{2}'' + 2\frac{1}{2}'' =$ 6. $\frac{7}{8}'' + 1\frac{3}{8}'' =$ 8. $\frac{3}{4}'' + 2'' =$

5. $1\frac{3}{4}'' + 1\frac{1}{4}'' =$ 7. $2\frac{3}{4}'' + \frac{3}{4}'' =$ 9. $2\frac{1}{4}'' + 3\frac{1}{4}'' =$

Test in Addition of Like Fractions

1.	2.	3.	4.	5.	6.
$\begin{array}{r} \frac{1}{8} \\ \frac{1}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{4} \\ \frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{7}{10} \\ \frac{1}{10} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{3}{8} \\ 2\frac{1}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{3} \\ \frac{1}{3} \\ \hline \end{array}$
7.	**8.**	**9.**	**10.**	**11.**	**12.**
$\begin{array}{r} 4\frac{1}{4} \\ 2\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{2} \\ 2\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{2}{3} \\ 3\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{7}{8} \\ 6\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{3}{10} \\ 7\frac{7}{10} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{6} \\ 3\frac{5}{6} \\ \hline \end{array}$

If you have more than one error in the test, repeat the test in addition on page 87.

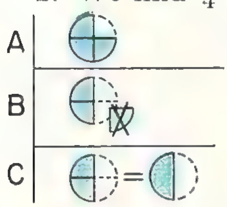


A $\frac{3}{4}$ PIE B $\frac{1}{4}$ IS TAKEN AWAY C $\frac{2}{4}$ OR $\frac{1}{2}$ PIE REMAINS

Subtraction of Like Fractions

1. We can use the pictures above or your cut-outs to find how much $\frac{3}{4} - \frac{1}{4}$ is. Tell the story the pictures show.

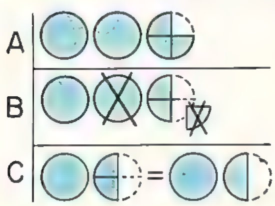
2. We find $\frac{3}{4} - \frac{1}{4}$ as shown below.



$$\begin{array}{r} \frac{3}{4} \\ -\frac{1}{4} \\ \hline \frac{2}{4} = \frac{1}{2} \end{array}$$

Use the drawing or cut-outs to explain the work in the example. How do we get the $\frac{2}{4}$ in the example? Why do we change $\frac{2}{4}$ to $\frac{1}{2}$?

3. How much is $2\frac{3}{4} - 1\frac{1}{4}$?



$$\begin{array}{r} 2\frac{3}{4} \\ -1\frac{1}{4} \\ \hline 1\frac{2}{4} = 1\frac{1}{2} \end{array}$$

Use the drawings or your cut-outs to explain the work in the example. How do we get the $1\frac{2}{4}$? Why do we change $1\frac{2}{4}$ to $1\frac{1}{2}$?

4. Show that the work below is correct.

a.	b.	c.	d.	e.
$\frac{3}{4}$	$\frac{1}{4}$	$6\frac{7}{8}$	$5\frac{3}{8}$	$4\frac{3}{4}$
$-\frac{2}{4}$	$-\frac{1}{4}$	$-6\frac{3}{8}$	$-4\frac{1}{8}$	$-\frac{3}{4}$
$\frac{1}{4}$	0	$\frac{4}{8} = \frac{1}{2}$	$1\frac{2}{8} = 1\frac{1}{4}$	4

Copy and subtract.

	a	b	c	d	e	f	g
5.	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{2}{3}$	$\frac{7}{10}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{1}{2}$
	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{2}{3}$	$\frac{2}{10}$	$\frac{1}{6}$	$\frac{5}{8}$	$\frac{1}{2}$
6.	$5\frac{3}{4}$	$8\frac{5}{8}$	$6\frac{3}{4}$	$6\frac{4}{5}$	$7\frac{3}{4}$	$8\frac{7}{8}$	$7\frac{5}{6}$
	1	$4\frac{1}{8}$	$5\frac{2}{4}$	$3\frac{2}{5}$	$\frac{3}{4}$	$\frac{1}{8}$	$7\frac{1}{6}$
7.	$5\frac{1}{2}$	$\frac{1}{8}$	$6\frac{1}{2}$	$7\frac{7}{8}$	$9\frac{5}{6}$	$8\frac{1}{2}$	$7\frac{2}{3}$
	3	$\frac{1}{8}$	$\frac{1}{2}$	$3\frac{3}{8}$	$\frac{3}{6}$	$6\frac{1}{2}$	$2\frac{1}{3}$

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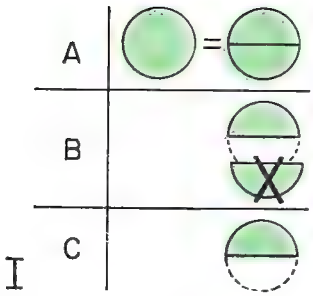

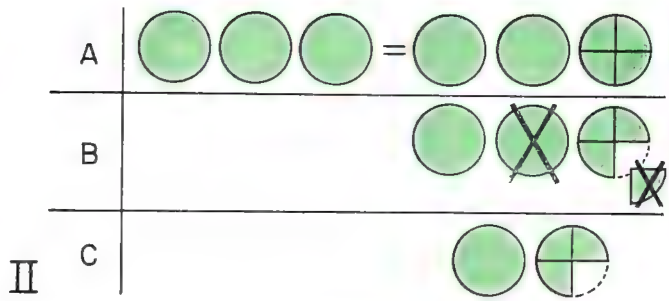

Subtracting Fractions from Whole Numbers

1. Use I above to explain how to find $1 - \frac{1}{2}$.

$$\begin{array}{rcl} 1 & = & \frac{2}{2} \\ -\frac{1}{2} & = & \frac{1}{2} \\ \hline & & \frac{1}{2} \end{array}$$

So that we can subtract, we change 1 to $\frac{2}{2}$. Then we subtract $\frac{2}{2} - \frac{1}{2}$. I B shows this. Use your cut-outs to prove that $1 - \frac{1}{2} = \frac{1}{2}$.

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2. Use II above to explain how to find $3 - 1\frac{1}{4}$.

$$\begin{array}{rcl} 3 & = & 2\frac{4}{4} \\ -1\frac{1}{4} & = & 1\frac{1}{4} \\ \hline & & 1\frac{3}{4} \end{array}$$

We cannot subtract $\frac{1}{4}$ until we change 3 to $2\frac{4}{4}$. How do we get the $1\frac{3}{4}$? II B shows this. Prove by addition that $1\frac{3}{4} + 1\frac{1}{4} = 2\frac{4}{4} = 3$.

3. Supply the missing numbers:

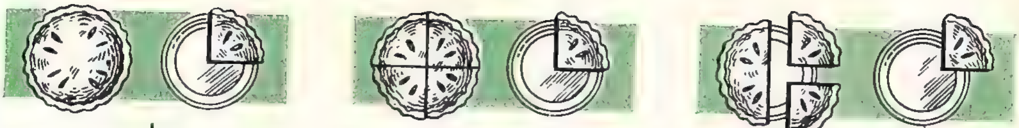
a. $1 = \frac{?}{4}$ b. $1 = \frac{?}{8}$ c. $4 = 3\frac{?}{4}$ d. $3 = 2\frac{?}{2}$ e. $5 = 4\frac{?}{3}$

Copy and subtract. Go over your work to check it.

	a	b	c	d	e	f	g
4.	1	1	1	1	2	2	2
	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{2}{5}$	$\frac{5}{8}$	$\frac{2}{3}$	$\frac{3}{10}$	$\frac{1}{4}$
5.	4	5	3	2	6	7	4
	$1\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{2}{5}$	$1\frac{1}{2}$	$3\frac{2}{3}$	$6\frac{5}{8}$	$2\frac{3}{8}$

Practice What You Have Learned

	a	b	c	d	e	f	g
1.	$\frac{1}{4}$	387		$7\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$	$3\frac{7}{8}$
	$+\frac{3}{4}$	$\times 95$	$27\overline{)810}$	$-2\frac{1}{4}$	$+2\frac{1}{4}$	$+6\frac{1}{2}$	$+4\frac{5}{8}$
2.	2	$3\frac{3}{4}$	1	$2\frac{3}{4}$	469	6	
	$-1\frac{1}{2}$	$+6\frac{3}{4}$	$-\frac{3}{8}$	$-1\frac{2}{4}$	$\times 87$	$-4\frac{2}{3}$	$16\overline{)805}$



A $1\frac{1}{4}$ B $1\frac{1}{4} = \frac{?}{4}$ C $\frac{5}{4} - \frac{3}{4} = ?$

Another Step in Subtracting Like Fractions

1. Peggy's mother had $1\frac{1}{4}$ pies. She cut the whole pie into fourths, making in all 5 fourths. She served 3 of the fourths ($\frac{3}{4}$) for dinner. How much pie remained? $1\frac{1}{4} - \frac{3}{4} = ?$

Tell the story shown by the drawings at the top of the page. Prove with your cut-outs that $1\frac{1}{4} - \frac{3}{4} = \frac{1}{2}$.

2. Use the above drawings to explain how to work the example $1\frac{1}{4} - \frac{3}{4}$.

$$\begin{array}{rcl} 1\frac{1}{4} & = & \frac{5}{4} \\ -\ \frac{3}{4} & = & \frac{3}{4} \\ \hline & & \frac{2}{4} = \frac{1}{2} \end{array}$$

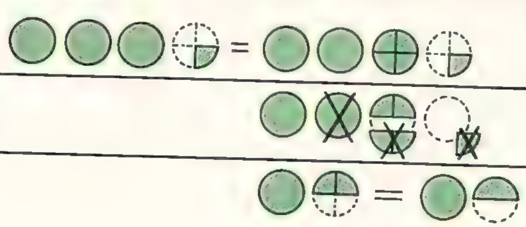
Why can we not subtract $\frac{3}{4}$ from $\frac{1}{4}$?
How do we change $1\frac{1}{4}$ to $\frac{5}{4}$?
How do we get the $\frac{2}{4}$?
Why do we change $\frac{2}{4}$ to $\frac{1}{2}$?

3. Use the drawings below to explain how to find $3\frac{1}{4} - 1\frac{3}{4}$.

A

B

C



$$\begin{array}{rcl} 3\frac{1}{4} & = & 2\frac{5}{4} \\ -1\frac{3}{4} & = & 1\frac{3}{4} \\ \hline & & 1\frac{2}{4} = 1\frac{1}{2} \end{array}$$

Why must we change $3\frac{1}{4}$? Use the drawings to show that $3\frac{1}{4} = 2\frac{5}{4}$. How do we get the $1\frac{1}{2}$?

4. Supply the missing numerators:

a. $1\frac{1}{3} = \frac{?}{3}$ $1\frac{3}{8} = \frac{?}{8}$ $1\frac{2}{5} = \frac{?}{5}$ $1\frac{5}{8} = \frac{?}{8}$

b. $4\frac{1}{3} = 3\frac{?}{3}$ $5\frac{5}{8} = 4\frac{?}{8}$ $8\frac{3}{5} = 7\frac{?}{5}$ $7\frac{3}{8} = 6\frac{?}{8}$

5. Explain the work below. Then copy and subtract.

a. $$\begin{array}{rcl} 1\frac{1}{3} & = & \frac{4}{3} \\ -\ \frac{2}{3} & = & \frac{2}{3} \\ \hline & & \frac{2}{3} \end{array}$$

b. $$\begin{array}{rcl} 5\frac{3}{8} & = & 4\frac{11}{8} \\ -2\frac{7}{8} & = & 2\frac{7}{8} \\ \hline & & 2\frac{4}{8} = 2\frac{1}{2} \end{array}$$

c. $$\begin{array}{rcl} 6\frac{1}{4} & = & 5\frac{5}{4} \\ -5\frac{2}{4} & = & 5\frac{2}{4} \\ \hline & & \frac{3}{4} \end{array}$$

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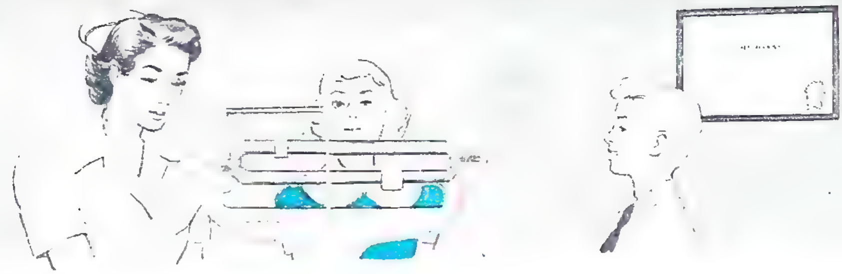

Measuring the Growth of Children

Miss Smith measures the height and weight of the children in September to see how much they have grown during the year. Here are the records for four of the children in the school.

	Height			Weight		
	Last Year	This Year	Gain	Last Year	This Year	Gain
Barbara	54 in.	$55\frac{1}{2}$ in.	?	$68\frac{1}{2}$ lb.	$74\frac{1}{2}$ lb.	?
Patricia	$58\frac{1}{2}$ in.	60 in.	?	86 lb.	$89\frac{3}{4}$ lb.	?
John	$55\frac{1}{2}$ in.	$58\frac{1}{2}$ in.	?	$74\frac{1}{2}$ lb.	78 lb.	?
Dick	$53\frac{1}{4}$ in.	$55\frac{3}{4}$ in.	?	$73\frac{3}{4}$ lb.	$77\frac{1}{4}$ lb.	?

Copy the table and find the missing numbers.

1. Find the **gain** (increase) in height for each child. Which one grew most in height?

2. Find the gain in weight for each child. Which one grew most in weight?

3. How much more did Barbara gain in weight than John?

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4. How much less did Patricia gain in height than Barbara?

★ 5. Why is it a good plan to measure your weight from time to time?

Test in Subtraction of Like Fractions

1. $\frac{5}{8} - \frac{1}{8} =$	2. $\frac{1}{2} - \frac{1}{2} =$	3. $4\frac{2}{3} - \frac{2}{3} =$	4. $8\frac{1}{4} - 5\frac{1}{4} =$
5. $6\frac{3}{4} - 2\frac{1}{4} =$	6. $1 - \frac{1}{2} =$	7. $2 - \frac{3}{4} =$	8. $4 - 1\frac{3}{8} =$
9. $5\frac{1}{3} - 4\frac{2}{3} =$	10. $7\frac{1}{4} - 4\frac{3}{4} =$	11. $5\frac{7}{8} - \frac{1}{8} =$	12. $6 - 5\frac{3}{4} =$

× ÷ + − = $ ¢ ℔ @ % ℅

Using "Sign" Language

In the examples below, the signs are missing. Study the three numbers that are given and decide what the sign should be. Write the example as it should be written. For example, in 1, what must you do with 48 and 35 to get 83?

1. $48 \ ? \ 35 = 83$
2. $650 \ ? \ 274 = 376$
3. $9 \ ? \ 67 = 603$
4. $10 \ ? \ 35 = 350$
5. $4\frac{3}{4} \ ? \ 1\frac{1}{4} = 3\frac{1}{2}$
6. $159 \ ? \ 53 = 3$
7. $6 \ ? \ 0 = 0$
8. $3\frac{1}{2} \ ? \ 1\frac{1}{2} = 2$
9. $720 \ ? \ 8 = 90$
10. $20 \ ? \ 20 = 400$
11. $5\frac{1}{4} \ ? \ 2\frac{1}{4} = 7\frac{1}{2}$
12. $810 \ ? \ 309 = 501$
13. $36 \ ? \ 40 = 1440$
14. $4\frac{1}{4} \ ? \ 1\frac{1}{4} = 3$
15. $305 \ ? \ 61 = 5$
16. $5\frac{3}{5} \ ? \ 5\frac{3}{5} = 0$
17. $120 \ ? \ 10 = 12$
18. $3\frac{3}{8} \ ? \ 5\frac{1}{8} = 8\frac{1}{2}$
19. $8 \ ? \ 8 = 1$
20. $3 \ ? \ 4 = \frac{3}{4}$
21. $8\frac{3}{4} \ ? \ 7\frac{1}{4} = 1\frac{1}{2}$
22. $\frac{1}{4} \ ? \ \frac{1}{4} = \frac{1}{2}$
23. $\frac{3}{8} \ ? \ \frac{3}{8} = \frac{3}{4}$
24. $5\frac{3}{4} \ ? \ \frac{3}{4} = 5$

Something Is Wrong

Find and correct the errors in each example below.

1. $\begin{array}{r} 9702 \\ \underline{-3682} \\ 6100 \end{array}$

2. $\begin{array}{r} 8070 \\ \underline{\times 6} \\ 4820 \end{array}$

3. $\begin{array}{r} 746 \\ \underline{\times 90} \\ 67{,}160 \end{array}$

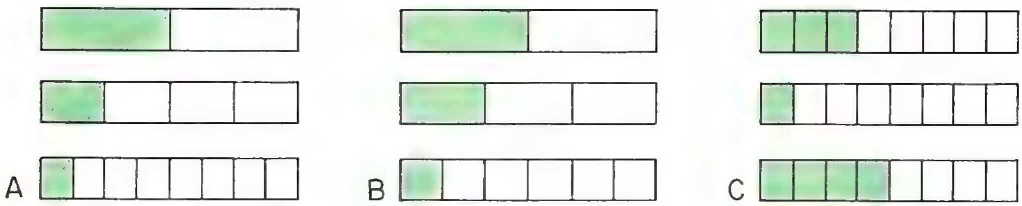
4. $\begin{array}{r} 6\text{ r}2 \\ 5\overline{)302} \\ \underline{30} \\ 2 \end{array}$

5. $\begin{array}{r} 7 \\ 57\overline{)399} \\ \underline{392} \\ 7 \end{array}$

6. $\begin{array}{r} 3 \\ 36\overline{)119} \\ \underline{118} \\ 1 \end{array}$

7. $\begin{array}{r} 3\frac{3}{4} \\ \underline{-1\frac{3}{4}} \\ 20 \end{array}$

8. $\begin{array}{r} 7\frac{3}{8} \\ \underline{+6\frac{4}{8}} \\ 13\frac{6}{8} = 14\frac{3}{4} \end{array}$



Using Drawings to Discover Relations among Fractions

1. Which is larger, $\frac{1}{2}$ or $\frac{1}{4}$? $\frac{1}{4}$ or $\frac{1}{8}$? $\frac{1}{2}$ or $\frac{1}{8}$? (See A.)

2. Which is larger, $\frac{1}{2}$ or $\frac{1}{3}$? $\frac{1}{2}$ or $\frac{1}{6}$? $\frac{1}{3}$ or $\frac{1}{6}$? (See B.)

3. Arrange the fractions $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{2}$ in order of their size, placing the largest fractions first. Do the same for the fractions $\frac{1}{2}$, $\frac{1}{6}$, and $\frac{1}{3}$. Use the drawings if necessary.

If the numerator is 1, the larger the denominator the smaller is the value of the fraction.

4. Tell which of the fractions in each group below is largest:

a. $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{4}$ b. $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$ c. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ d. $\frac{1}{5}$, $\frac{1}{2}$, $\frac{1}{10}$

5. Which of these fractions has the largest value: $\frac{3}{8}$, $\frac{1}{8}$, or $\frac{4}{8}$? (See C.)

When several fractions have the same denominator, the fraction with the largest numerator has the largest value.

6. Use A to show which is more: $\frac{2}{2}$ or $\frac{2}{4}$; $\frac{2}{2}$ or $\frac{2}{8}$; $\frac{2}{4}$ or $\frac{2}{8}$.

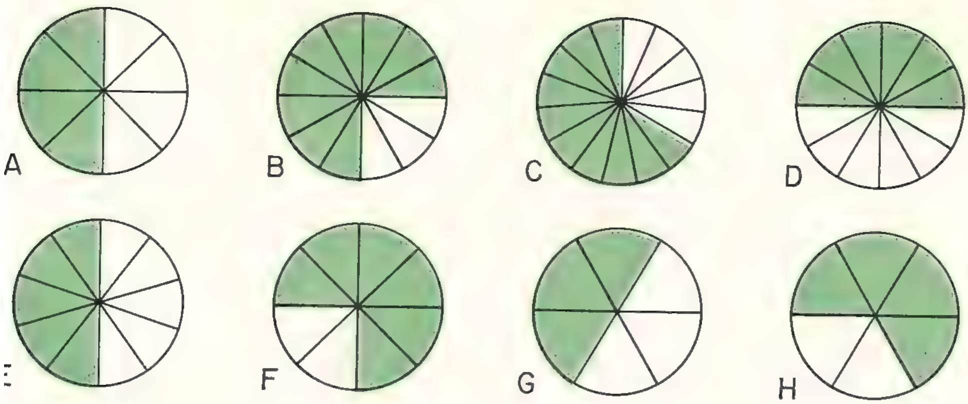
7. Use B to tell which is more: $\frac{2}{2}$ or $\frac{2}{6}$; $\frac{2}{2}$ or $\frac{2}{3}$; $\frac{2}{3}$ or $\frac{2}{6}$.

When two unlike fractions have the same numerator, the fraction with the larger denominator is the smaller fraction.

8. Which is more, $\frac{3}{4}$ or $\frac{3}{6}$? $\frac{3}{4}$ or $\frac{3}{2}$? $\frac{3}{4}$ or $\frac{3}{8}$? Use drawings to prove your answers.

9. Arrange the fractions in each group in order of size, placing the largest fraction first.

a. $\frac{2}{3}$, $\frac{2}{6}$, $\frac{2}{4}$, $\frac{2}{2}$ b. $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{6}$, $\frac{3}{3}$ c. $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{8}$, $\frac{1}{6}$



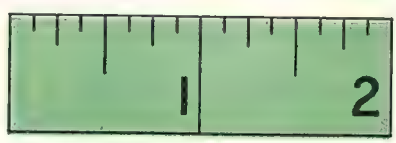
Equal Fractions

1. In which drawing is $\frac{1}{2}$ of the circle green? $\frac{3}{4}$ of the circle? $\frac{2}{3}$ of the circle? Prove that your answers are correct.

2. Which of the fractions below are equal to $\frac{1}{2}$? to $\frac{3}{8}$? to $\frac{2}{5}$?

$\frac{6}{12}$ $\frac{6}{15}$ $\frac{6}{16}$ $\frac{4}{10}$ $\frac{8}{16}$ $\frac{9}{24}$ $\frac{4}{8}$ $\frac{8}{20}$ $\frac{7}{14}$

Discovering Sums with a Ruler



1. Into what parts is each inch on the ruler divided?

2. Count from the left end of the ruler, starting with $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, and so on to 2 inches.

3. Use the ruler to tell how much $\frac{1}{4}$ in. + $\frac{1}{8}$ in. is. You see that $\frac{1}{4} + \frac{1}{8}$ is the same as $\frac{2}{8} + \frac{1}{8}$, or $\frac{?}{8}$ in.

4. Use the ruler to tell how much $\frac{1}{2}$ in. + $\frac{1}{4}$ in. is. You see that $\frac{1}{2} + \frac{1}{4}$ is the same as $\frac{2}{4} + \frac{1}{4}$, or $\frac{?}{4}$ in.

5. Use the ruler to show that $\frac{1}{2}$ in. + $\frac{1}{8}$ in. is the same as $\frac{4}{8}$ in. + $\frac{1}{8}$ in., or $\frac{?}{8}$ in.

6. To add halves and fourths, we change halves to ?.

7. To add halves and eighths, we change halves to ?.

8. To add fourths and eighths, we change fourths to ?.

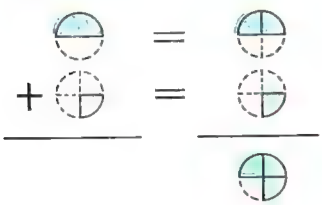
A $\frac{1}{2} + \frac{1}{4} = \frac{?}{4}$ B $\frac{1}{2} + \frac{3}{8} = \frac{?}{8}$ C $\frac{1}{4} + \frac{1}{8} = \frac{?}{8}$

Addition of Halves, Fourths, and Eighths

1. What two fractions are added in A?

To add dimes and pennies we change the dimes to pennies. To add halves and fourths we change halves to fourths.

2. Use A and your cut-outs to show that $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$.



$$\begin{array}{rcl} \frac{1}{2} & = & \frac{2}{4} \\ +\frac{1}{4} & = & \frac{1}{4} \\ \hline & & \frac{3}{4} \end{array}$$

3. Use the drawing at the left to explain the work in the example.

Why do we change $\frac{1}{2}$ to $\frac{2}{4}$? How do we find the sum $\frac{3}{4}$?

4. Use B and your cut-outs to explain the work below.

$$\begin{array}{rcl} \frac{1}{2} & = & \frac{4}{8} \\ +\frac{3}{8} & = & \frac{3}{8} \\ \hline & & \frac{7}{8} \end{array}$$

Why do we change $\frac{1}{2}$ to $\frac{4}{8}$? Why can we not change eighths to halves? Tell how to find $\frac{7}{8}$.

5. What example is shown by C? Work the example. Check with your cut-outs.

6. Explain each step shown below. Find the sums.

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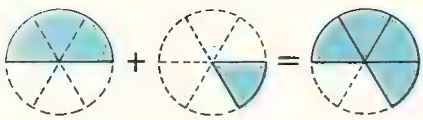
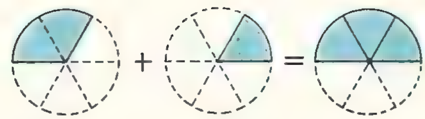
a. $\begin{array}{rcl} \frac{1}{4} & = & \frac{1}{4} \\ \frac{1}{2} & = & \frac{2}{4} \\ \hline \end{array}$ b. $\begin{array}{rcl} 3\frac{3}{8} & = & 3\frac{3}{8} \\ 2\frac{1}{4} & = & 2\frac{2}{8} \\ \hline \end{array}$ c. $\begin{array}{rcl} \frac{1}{2} & = & \frac{4}{8} \\ \frac{5}{8} & = & \frac{5}{8} \\ \hline \end{array}$ d. $\begin{array}{rcl} 4\frac{3}{4} & = & 4\frac{3}{4} \\ 2\frac{1}{2} & = & 2\frac{2}{4} \\ \hline \end{array}$

Copy and add. Go over your work to check it.

	a	b	c	d	e	f	g
7.	$\frac{1}{2}$ $\frac{1}{4}$	$\frac{1}{4}$ $\frac{1}{8}$	$\frac{1}{8}$ $\frac{1}{2}$	$\frac{3}{4}$ $\frac{1}{2}$	$\frac{3}{4}$ $\frac{7}{8}$	$\frac{1}{2}$ $\frac{3}{4}$	$\frac{5}{8}$ $\frac{3}{4}$
8.	$5\frac{1}{4}$ $6\frac{1}{8}$	$4\frac{1}{2}$ $3\frac{1}{4}$	$7\frac{3}{4}$ $2\frac{1}{8}$	$5\frac{1}{8}$ $7\frac{1}{2}$	$6\frac{1}{2}$ $4\frac{3}{4}$	$9\frac{3}{4}$ $6\frac{7}{8}$	$6\frac{5}{8}$ $8\frac{3}{4}$



A $\frac{1}{2} + \frac{1}{6} = \frac{?}{6} = \frac{?}{3}$



B $\frac{1}{3} + \frac{1}{6} = \frac{?}{6} = \frac{?}{2}$

Adding Halves, Thirds, and Sixths

1. Use A to find $\frac{1}{2} + \frac{1}{6}$. What part of the first circle is blue? $\frac{1}{2} = \frac{?}{6}$. What part of the second circle is blue? How many sixths in all are blue? How many thirds?

2. We can add the fractions $\frac{1}{2}$ and $\frac{1}{6}$, as shown below.

$$\begin{array}{rcl} \frac{1}{2} & = & \frac{3}{6} \\ +\frac{1}{6} & = & \frac{1}{6} \\ \hline & & \frac{4}{6} = \frac{2}{3} \end{array}$$

To add, we must have two like fractions. We can change $\frac{1}{2}$ to $\frac{3}{6}$, as shown above. What is the sum of $\frac{3}{6} + \frac{1}{6}$? How do we change $\frac{4}{6}$ to $\frac{2}{3}$? Why?

3. Let us use drawing B above to find the sum of $\frac{1}{3}$ and $\frac{1}{6}$.

$$\begin{array}{rcl} \frac{1}{3} & = & \frac{2}{6} \\ +\frac{1}{6} & = & \frac{1}{6} \\ \hline & & \frac{3}{6} = \frac{1}{2} \end{array}$$

Show that $\frac{1}{3}$ of the first circle in B is blue. How many sixths are there in $\frac{1}{3}$ of the circle? Why can we add $\frac{2}{6}$ and $\frac{1}{6}$? Why do we change $\frac{3}{6}$ to $\frac{1}{2}$?

4. Explain the work shown below. Find the sums.

a. $\begin{array}{rcl} \frac{1}{6} & = & \frac{1}{6} \\ \frac{2}{3} & = & \frac{4}{6} \\ \hline \end{array}$ b. $\begin{array}{rcl} 3\frac{1}{2} & = & 3\frac{3}{6} \\ 2\frac{1}{6} & = & 2\frac{1}{6} \\ \hline \end{array}$ c. $\begin{array}{rcl} \frac{5}{6} & = & \frac{5}{6} \\ \frac{1}{2} & = & \frac{3}{6} \\ \hline \end{array}$

Fractions with unlike denominators cannot be added. First they must be changed to the same denominator.

Find the sums.

	a	b	c	d	e	f
5.	$\frac{1}{6}$ $\frac{1}{3}$	$\frac{5}{6}$ $\frac{1}{3}$	$\frac{1}{6}$ $\frac{1}{2}$	$\frac{1}{2}$ $\frac{5}{6}$	$\frac{2}{3}$ $\frac{1}{6}$	$\frac{5}{6}$ $\frac{2}{3}$
6.	$5\frac{1}{2}$ $2\frac{1}{6}$	$5\frac{1}{3}$ $6\frac{1}{6}$	$7\frac{1}{2}$ $3\frac{5}{6}$	$6\frac{5}{6}$ $4\frac{1}{3}$	$8\frac{2}{3}$ $7\frac{5}{6}$	$5\frac{5}{6}$ $4\frac{1}{2}$

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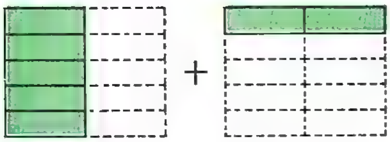
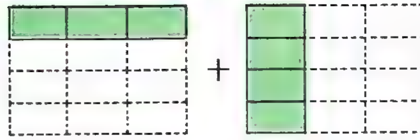


A $\frac{1}{2} + \frac{1}{5} = \frac{?}{10}$



B $\frac{1}{4} + \frac{1}{3} = \frac{?}{12}$

A New Step in Adding Unlike Fractions

Use the drawings above to find $\frac{1}{2} + \frac{1}{5}$, and $\frac{1}{4} + \frac{1}{3}$.

1. Into how many parts is each of the rectangles in A divided? What part of each rectangle in A is green?

2. Use the drawing to explain the work in $\frac{1}{2} + \frac{1}{5}$.

$$\begin{array}{rcl} \frac{1}{2} & = & \frac{5}{10} \\ +\frac{1}{5} & = & \frac{2}{10} \\ \hline & & \frac{7}{10} \end{array}$$

How do we change $\frac{1}{2}$ and $\frac{1}{5}$ to tenths? Why? What is the sum?

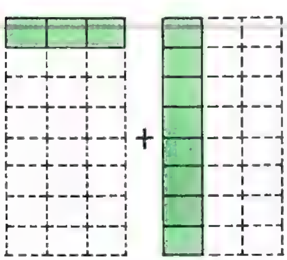
3. Into how many parts is each rectangle in B divided? What part of each rectangle is green?

$$\begin{array}{rcl} \frac{1}{4} & = & \frac{3}{12} \\ +\frac{1}{3} & = & \frac{4}{12} \\ \hline & & \frac{7}{12} \end{array}$$

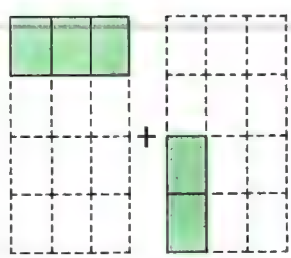
4. Use B to explain each step in $\frac{1}{4} + \frac{1}{3}$. How do we change $\frac{1}{4}$ and $\frac{1}{3}$ to twelfths? Why must we change $\frac{1}{4}$ and $\frac{1}{3}$ to twelfths?

5. Make drawings like B showing $\frac{2}{3}+\frac{1}{4}$; $\frac{1}{4}+\frac{1}{6}$. Then find the sums of $\frac{2}{3} + \frac{1}{4}$ and $\frac{1}{4} + \frac{1}{6}$ by addition.

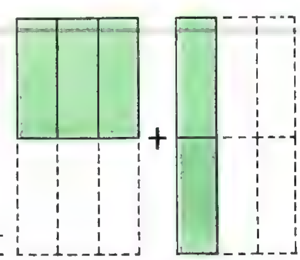
Use these drawings to answer the questions below them.



C



D

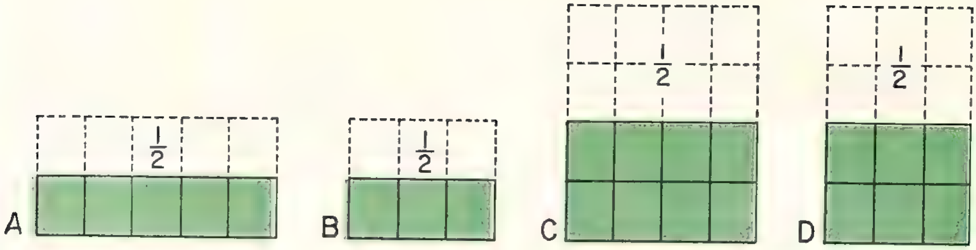


E

6. Which drawing shows the example $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = ?$

7. Which drawing shows the example $\frac{1}{8} + \frac{1}{3} = \frac{3}{24} + \frac{8}{24} = ?$

8. Which drawing shows the example $\frac{1}{4} + \frac{1}{6} = \frac{3}{12} + \frac{2}{12} = ?$



Changing Names Does Not Change Values

1. Which drawing shows that $\frac{1}{2}$ is equal to $\frac{3}{6}$? to $\frac{5}{10}$? to $\frac{8}{16}$? to $\frac{6}{12}$?

2. Prove by dividing both terms that each fraction equals $\frac{1}{2}$.

3. In adding $\frac{1}{2}$ to $\frac{1}{6}$, we must change $\frac{1}{2}$ to $\frac{3}{6}$. Why?

Divide the denominator 6 by the denominator 2. To change $\frac{1}{2}$ to sixths we must multiply both terms by 3.

$$\frac{1}{2}=\frac{3\times 1}{3\times 2}=\frac{3}{6}$$

4. Can you tell how to change $\frac{1}{2}$ to $\frac{5}{10}$?

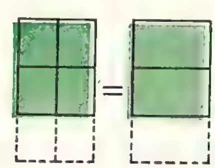
$$\frac{1}{2}=\frac{?\times 1}{?\times 2}=\frac{5}{10}$$

5. Tell a quick way to change $\frac{1}{2}$ to $\frac{2}{4}$; $\frac{1}{2}$ to $\frac{4}{8}$, $\frac{1}{2}$ to $\frac{6}{12}$.

When we multiply both numerator and denominator by the same number, we get a fraction of equal value.

6. Prove with A above that when we change $\frac{1}{2}$ to $\frac{5}{10}$ we get a fraction with more parts. Show that the parts are smaller.

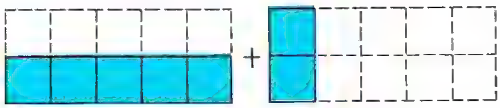
7. Use the drawing at the right to show that when we change $\frac{4}{6}$ to $\frac{2}{3}$ we get a fraction with fewer, but larger, parts.



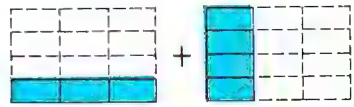
Find the missing numerators:

	a	b	c	d	e
8.	$\frac{1}{2}=\frac{?}{4}$	$\frac{1}{2}=\frac{?}{8}$	$\frac{1}{2}=\frac{?}{16}$	$\frac{1}{2}=\frac{?}{12}$	$\frac{1}{2}=\frac{?}{6}$
9.	$\frac{1}{4}=\frac{?}{20}$	$\frac{1}{3}=\frac{?}{6}$	$\frac{2}{3}=\frac{?}{6}$	$\frac{1}{3}=\frac{?}{12}$	$\frac{2}{3}=\frac{?}{24}$
10.	$\frac{1}{8}=\frac{?}{16}$	$\frac{5}{8}=\frac{?}{16}$	$\frac{7}{8}=\frac{?}{16}$	$\frac{3}{4}=\frac{?}{24}$	$\frac{3}{4}=\frac{?}{20}$
11.	$\frac{3}{5}=\frac{?}{10}$	$\frac{4}{5}=\frac{?}{10}$	$\frac{1}{10}=\frac{?}{100}$	$\frac{4}{10}=\frac{?}{100}$	$\frac{7}{12}=\frac{?}{36}$

MORE PRACTICE 345



A $\frac{1}{2} + \frac{1}{5} = \frac{?}{10}$



B $\frac{1}{4} + \frac{1}{3} = \frac{?}{12}$

Finding a Common Denominator

$\frac{1}{2} = \frac{5}{10}$
$\frac{1}{5} = \frac{2}{10}$
$\frac{7}{10}$

1. A shows the example $\frac{1}{2} + \frac{1}{5}$. Use the drawing to explain the work at the left. Why do we change both $\frac{1}{2}$ and $\frac{1}{5}$ to tenths?

   Notice that the product of the denominators, 2 and 5, is 10.

$\frac{1}{4} = \frac{3}{12}$
$\frac{1}{3} = \frac{4}{12}$
$\frac{7}{12}$

2. B shows the example $\frac{1}{4} + \frac{1}{3}$. Use the drawing to explain the work at the left. To what denominator were both fractions changed?

   Notice that $4 \times 3 = 12$.

3. How much is $\frac{1}{4} + \frac{1}{5}$?

$\frac{1}{4} = \frac{5}{20}$
$\frac{1}{5} = \frac{4}{20}$
$\frac{9}{20}$

Try 4×5, or 20, as the new denominator. Explain how we change $\frac{1}{4}$ to $\frac{5}{20}$ and $\frac{1}{5}$ to $\frac{4}{20}$. What is the sum of the fractions?

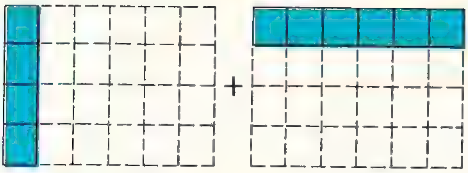
There is an easy way to find a **common** denominator for two unlike fractions. **Multiply their denominators,** as shown in 1, 2, and 3.

4. To what denominator can we change $\frac{3}{4}$ and $\frac{2}{3}$? $\frac{1}{2}$ and $\frac{1}{3}$?

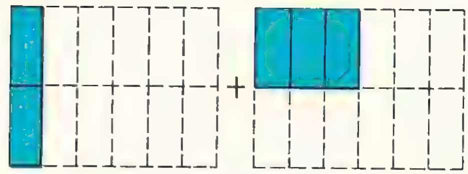
MORE PRACTICE 346

Copy and add.

	a	b	c	d	e	f	g
5.	$\frac{1}{2}$ $\frac{1}{3}$	$\frac{2}{3}$ $\frac{1}{2}$	$\frac{1}{3}$ $\frac{2}{3}$	$\frac{2}{4}$ $\frac{3}{4}$	$\frac{3}{5}$ $\frac{1}{5}$	$\frac{2}{5}$ $\frac{1}{4}$	$\frac{4}{5}$ $\frac{1}{2}$
6.	$3\frac{1}{4}$ $4\frac{1}{3}$	$4\frac{1}{2}$ $3\frac{1}{5}$	$6\frac{1}{4}$ $7\frac{1}{5}$	$7\frac{1}{3}$ $6\frac{1}{8}$	$6\frac{7}{8}$ $4\frac{2}{3}$	$4\frac{3}{5}$ $6\frac{3}{8}$	$7\frac{1}{2}$ $5\frac{2}{3}$
7.	$\frac{1}{4}$ $\frac{1}{6}$	$3\frac{3}{4}$ $2\frac{5}{6}$	$6\frac{1}{8}$ $7\frac{1}{6}$	$8\frac{1}{4}$ $5\frac{1}{10}$	$7\frac{9}{10}$ $2\frac{3}{4}$	$6\frac{5}{6}$ $3\frac{1}{4}$	$8\frac{7}{8}$ $5\frac{5}{6}$



A $\frac{1}{6}\left(\frac{4}{24}\right) + \frac{1}{4}\left(\frac{6}{24}\right) = \frac{?}{24}$



B $\frac{1}{6}\left(\frac{2}{12}\right) + \frac{1}{4}\left(\frac{3}{12}\right) = \frac{?}{12}$

Using the Smallest Possible Denominator

1. Below, you see one way to find $\frac{1}{6} + \frac{1}{4}$.

$$\begin{aligned} \tfrac{1}{6} &= \tfrac{4}{24} \\ \tfrac{1}{4} &= \tfrac{6}{24} \\ \hline & \tfrac{10}{24} = \tfrac{5}{12} \end{aligned}$$

How do we get the denominator 24?
How do we change $\frac{1}{6}$ and $\frac{1}{4}$ to 24ths?
What is the sum?
How does A show this?

2. The work below shows another way to find $\frac{1}{6} + \frac{1}{4}$.

$$\begin{aligned} \tfrac{1}{6} &= \tfrac{2}{12} \\ \tfrac{1}{4} &= \tfrac{3}{12} \\ \hline & \tfrac{5}{12} \end{aligned}$$

Why can we change both $\frac{1}{6}$ and $\frac{1}{4}$ to 12ths?
How do we get the $\frac{2}{12}$ and the $\frac{3}{12}$?
Show that the sums in 1 and 2 are the same.

We say that 12 is the **smallest common denominator** of $\frac{1}{6}$ and $\frac{1}{4}$. This is because 12 is the smallest number that will contain both 6 and 4.

3. Give two possible denominators of $\frac{1}{6}$ and $\frac{1}{8}$.
Think: $6 \times 8 = 48$, one denominator.
24 will also contain 6 and 8.

4. Add $\frac{1}{6}$ and $\frac{1}{8}$, using both denominators.

5. Give the smallest possible common denominator for each pair of fractions. Then find their sums.

a. $\frac{1}{6}, \frac{1}{10}$ b. $\frac{7}{8}, \frac{5}{6}$ c. $\frac{7}{8}, \frac{3}{10}$ d. $\frac{3}{4}, \frac{7}{10}$

Add, using the smallest possible common denominator:

	a	b	c	d	e	f
6.	$\frac{5}{6}$	$\frac{5}{6}$	$3\frac{1}{6}$	$7\frac{7}{10}$	$5\frac{5}{8}$	$9\frac{3}{4}$
	$\frac{1}{10}$	$\frac{7}{8}$	$5\frac{7}{10}$	$6\frac{3}{8}$	$3\frac{7}{12}$	$8\frac{9}{10}$
7.	$4\frac{1}{8}$	$4\frac{3}{4}$	$4\frac{3}{4}$	$3\frac{3}{8}$	$9\frac{5}{6}$	$5\frac{5}{6}$
	$2\frac{1}{6}$	$2\frac{1}{6}$	$4\frac{1}{10}$	$4\frac{5}{12}$	$3\frac{7}{8}$	$3\frac{7}{10}$

MORE PRACTICE 346

Finding Errors in Addition of Fractions

Find the errors; then work the example correctly.

1. $\begin{array}{r} 5\frac{3}{8}\\ 2\frac{1}{8}\\ \hline 7\frac{4}{8}\end{array}$

2. $\begin{array}{r} 8\frac{2}{3}\\ 8\frac{1}{3}\\ \hline 15\frac{3}{3}\end{array} = 1$

3. $\begin{array}{r} \frac{4}{5}\\ 8\frac{4}{5}\\ \hline 8\frac{8}{5}\end{array}$

4. $\begin{array}{rcr} 4\frac{1}{8} & = & \frac{1}{8}\\ 6\frac{3}{4} & = & \frac{4}{8}\\ \hline & & \frac{5}{8}\end{array}$

5. $\frac{3}{4} + \frac{1}{6} = \frac{4}{10} = \frac{2}{5}$

6. $\begin{array}{rcl} \frac{5}{6} & = & \frac{40}{48}\\ \frac{3}{8} & = & \frac{24}{48}\\ \hline & & \frac{64}{48} = 1\frac{1}{2}\end{array}$

7. $\frac{3}{4} + \frac{5}{8} + \frac{1}{2} = \frac{6}{8} + \frac{5}{8} + \frac{4}{8} = \frac{14}{8} = 1\frac{6}{8} = 1\frac{3}{4}$

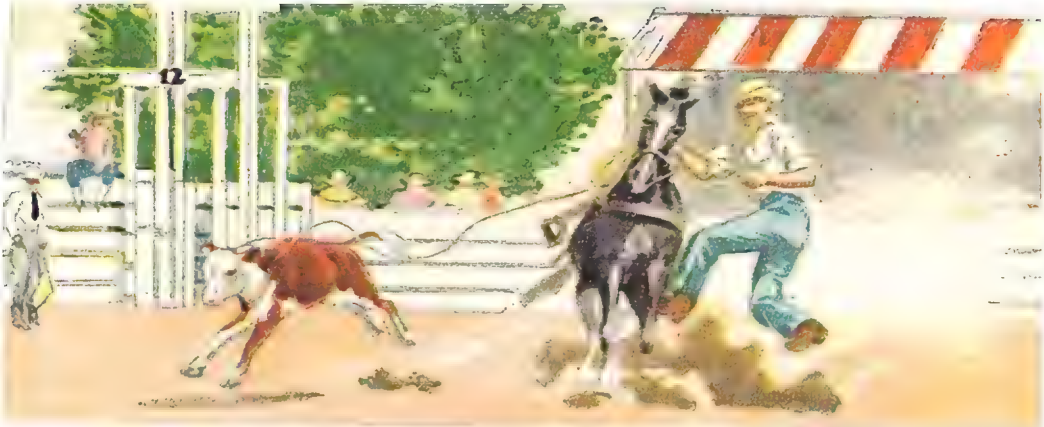
Practice in Addition of Fractions

MORE PRACTICE 347

	a	b	c	d	e	f	g
1.	$\begin{array}{r}\frac{1}{4}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{8}\\ \frac{3}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{3}\\ \frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{2}\\ \frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{7}{10}\\ \frac{5}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{4}\\ \frac{3}{4}\\ \hline\end{array}$
2.	$\begin{array}{r}5\frac{3}{8}\\ 2\frac{1}{8}\\ \hline\end{array}$	$\begin{array}{r}6\frac{1}{2}\\ 7\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}8\frac{1}{6}\\ 3\frac{1}{6}\\ \hline\end{array}$	$\begin{array}{r}5\frac{3}{4}\\ 6\frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}7\frac{7}{10}\\ 8\frac{8}{10}\\ \hline\end{array}$	$\begin{array}{r}6\frac{3}{4}\\ 8\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}8\frac{3}{8}\\ 5\frac{3}{8}\\ \hline\end{array}$
3.	$\begin{array}{r}\frac{1}{2}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{8}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{2}\\ \frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{3}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{5}\\ \frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \frac{7}{8}\\ \hline\end{array}$
4.	$\begin{array}{r}6\frac{1}{8}\\ 2\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}7\frac{3}{4}\\ 6\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}6\frac{1}{3}\\ 2\frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}7\frac{1}{2}\\ 9\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}6\frac{3}{4}\\ 5\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}7\frac{5}{6}\\ 3\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}8\frac{3}{4}\\ 9\frac{7}{8}\\ \hline\end{array}$

For Those Who Need More Practice

5.	$\begin{array}{r}7\frac{5}{6}\\ 6\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}7\frac{7}{8}\\ 6\frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}9\frac{1}{2}\\ 6\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}7\frac{1}{2}\\ 6\frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}9\frac{3}{4}\\ 7\frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}3\frac{1}{4}\\ 9\frac{1}{5}\\ \hline\end{array}$	$\begin{array}{r}8\frac{1}{2}\\ 8\frac{7}{10}\\ \hline\end{array}$



At a Western Rodeo

1. It took Bob 34 seconds to rope and tie a calf. Dan roped and tied another calf in $38\frac{4}{5}$ seconds. How much less time did it take Bob than it took Dan?

2. The rodeo record was $18\frac{3}{5}$ seconds. How much longer did it take Dan? How much longer did it take Bob?

3. The time limit for roping and tying a calf was 2 minutes. How much less than the time limit did it take Bob?

4. In the bull-dogging contest, Sam threw his steer in $14\frac{3}{5}$ seconds. George threw his steer in $15\frac{1}{5}$ seconds. Find the difference in time.

5. The time limit for riding a bucking broncho was 8 seconds. Tom fell off after riding only $4\frac{1}{5}$ seconds. How much less than the time limit was this?

6. In the high-jumping contest, Bob's horse jumped 5 feet 4 inches. Ted's horse jumped 5 feet 2 inches. How much higher did Bob's horse jump than Ted's horse?

★7. A pony ran around the $\frac{1}{4}$-mile track twice in one race. The first time around took $34\frac{1}{2}$ seconds, the second time $32\frac{4}{5}$ seconds. How long was the race? How long did it take the pony to run around the track twice?

Diagnostic Test in Addition of Unlike Fractions

Repeat the diagnostic test on addition of like fractions on page 87. Correct all errors.

Then copy and work the examples below.

	a	b	c	d	e	
1.	$\begin{array}{r}\frac{1}{2}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{6}\\ \frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{4}\\ \frac{1}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{8}\\ \frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \frac{1}{2}\\ \hline\end{array}$	(100)
2.	$\begin{array}{r}2\frac{1}{4}\\ 3\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}3\frac{3}{8}\\ 2\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}3\frac{1}{2}\\ 2\frac{1}{6}\\ \hline\end{array}$	$\begin{array}{r}3\frac{1}{4}\\ 4\frac{3}{8}\\ \hline\end{array}$	$\begin{array}{r}3\frac{3}{10}\\ 6\frac{1}{2}\\ \hline\end{array}$	(100)
3.	$\begin{array}{r}3\frac{3}{4}\\ 2\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}8\frac{7}{8}\\ 3\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}4\frac{1}{4}\\ 2\frac{7}{8}\\ \hline\end{array}$	$\begin{array}{r}3\frac{2}{3}\\ 4\frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}6\frac{1}{2}\\ 9\frac{7}{10}\\ \hline\end{array}$	(100)
4.	$\begin{array}{r}\frac{1}{3}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{2}\\ \frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{5}\\ \frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}\frac{4}{5}\\ \frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \frac{3}{4}\\ \hline\end{array}$	(104, 105)
5.	$\begin{array}{r}6\frac{1}{2}\\ 4\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}7\frac{1}{4}\\ 6\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}3\frac{3}{4}\\ 6\frac{2}{5}\\ \hline\end{array}$	$\begin{array}{r}7\frac{5}{6}\\ 3\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}8\frac{7}{8}\\ 4\frac{5}{6}\\ \hline\end{array}$	(104, 105)

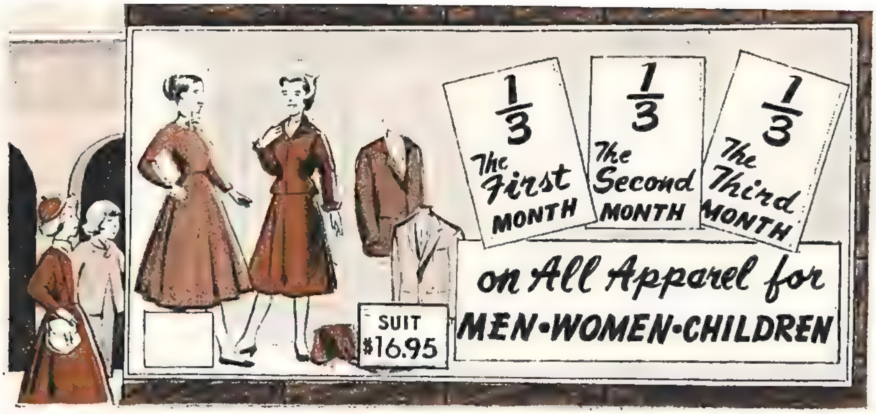
Turn for help to the pages given at the right of the row.

★For Those with No Work to Correct

Find the missing numbers in the examples below:

1. $\begin{array}{r}6\frac{?}{?}\\ +?\frac{1}{3}\\ \hline 9\frac{2}{3}\end{array}$ 2. $\begin{array}{r}?\\ -4\frac{1}{2}\\ \hline 1\frac{1}{2}\end{array}$ 3. $\begin{array}{r}?\frac{?}{?}\\ -6\frac{1}{4}\\ \hline 3\frac{1}{2}\end{array}$ 4. $\begin{array}{r}5\\ -1\frac{?}{?}\\ \hline 3\frac{1}{4}\end{array}$ 5. $\begin{array}{r}6\frac{3}{4}\\ +?\frac{1}{2}\\ \hline 9\frac{1}{4}\end{array}$

6. $\begin{array}{r}674\\ -???\\ \hline 258\end{array}$ 7. $\begin{array}{r}???\\ -486\\ \hline 203\end{array}$ 8. $\begin{array}{r}3?5?\\ \times 6\\ \hline 21,?18\end{array}$ 9. $\begin{array}{r}?2\\ 27\overline{)8??}\\ 81\\ \hline 54\\ ??\\ \hline\end{array}$ 10. $\begin{array}{r}5\frac{1}{2}\\ -?\frac{?}{?}\\ \hline 2\end{array}$



"3-Pay Plan"

1. What part of the total cost must be paid the first month?

2. What part of the total cost of clothing is paid in the first two months? What part is paid in three months?

3. How much is the first monthly payment on a boy's suit that costs $16.95?

4. How much remains to be paid on the $16.95 suit after the first monthly payment has been made?

5. What is the total of the first two monthly payments?

6. How much remains to be paid on the $16.95 suit after two payments have been made?

★7. Kate bought 2 dresses at the store at $5.85 each. Answer the questions in problems 3, 4, and 5 about payments for the two dresses.

Are You Ready to Subtract Unlike Fractions?

Subtract. Check by addition.

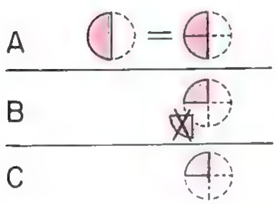
	a	b	c	d	e	f
1.	$3\frac{3}{4}$ $-1\frac{1}{4}$	$8\frac{1}{2}$ $-4\frac{1}{2}$	$7\frac{7}{8}$ $-1\frac{3}{8}$	$4\frac{1}{2}$ $-1\frac{1}{2}$	$6\frac{3}{4}$ $-6\frac{1}{4}$	$14\frac{3}{4}$ $-4\frac{3}{4}$
2.	1 $-\frac{1}{4}$	3 $-\frac{1}{2}$	9 $-\frac{1}{4}$	$1\frac{1}{4}$ $-\frac{3}{4}$	$6\frac{1}{3}$ $-4\frac{2}{3}$	$25\frac{3}{8}$ $-14\frac{7}{8}$

Subtraction of Unlike Fractions

1. Bobby had half of a melon. He cut the half melon into 2 quarter melons. He ate one of the quarters. How much of the melon remained? $\frac{1}{2} - \frac{1}{4} = ?$

Use cut-outs to tell the story shown in the drawings.

2. Use the drawings at the left to explain the work below.



$\frac{1}{2} = \frac{2}{4}$

$-\frac{1}{4} = \frac{1}{4}$

$\frac{1}{4}$

Why do we change $\frac{1}{2}$ to $\frac{2}{4}$? How do we subtract like fractions? Explain how we find the remainder $\frac{1}{4}$.

3. Explain each step below. Then copy and subtract.

a. $\frac{5}{8} = \frac{5}{8}$; $\frac{1}{2} = \frac{4}{8}$; $\frac{1}{8}$

b. $3\frac{1}{2} = 3\frac{2}{4}$; $1\frac{1}{4} = 1\frac{1}{4}$; $2\frac{1}{4}$

c. $6\frac{7}{8} = 6\frac{7}{8}$; $1\frac{3}{4} = 1\frac{6}{8}$; $5\frac{1}{8}$

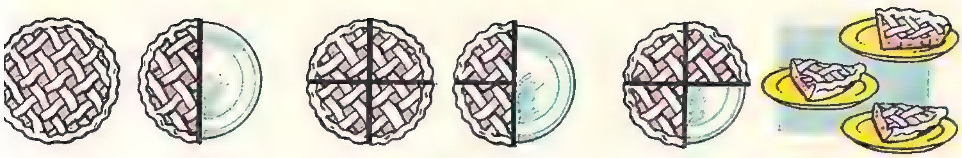
d. $6\frac{1}{2} = 6\frac{3}{6}$; $1\frac{1}{6} = 1\frac{1}{6}$; $5\frac{2}{6} = 5\frac{1}{3}$

To subtract unlike fractions, first change them to like fractions, as shown above.

MORE PRACTICE 348

Copy and subtract. Check your work by addition.

	a	b	c	d	e	f	g
4.	$\frac{3}{4}$ $\frac{1}{8}$	$\frac{1}{2}$ $\frac{1}{8}$	$\frac{1}{2}$ $\frac{1}{6}$	$\frac{7}{8}$ $\frac{3}{4}$	$\frac{3}{4}$ $\frac{3}{8}$	$\frac{1}{5}$ $\frac{1}{10}$	$\frac{7}{10}$ $\frac{1}{2}$
5.	$5\frac{1}{2}$ $2\frac{1}{4}$	$6\frac{3}{4}$ $2\frac{1}{2}$	$3\frac{7}{8}$ $2\frac{1}{4}$	$6\frac{5}{6}$ $2\frac{1}{2}$	$3\frac{1}{2}$ $1\frac{3}{8}$	$6\frac{3}{4}$ $2\frac{5}{8}$	$8\frac{1}{2}$ $2\frac{1}{6}$
6.	$6\frac{3}{4}$ $6\frac{1}{2}$	$8\frac{5}{8}$ $2\frac{1}{4}$	$6\frac{3}{4}$ $2\frac{5}{8}$	$9\frac{7}{12}$ $2\frac{1}{2}$	$7\frac{1}{2}$ $3\frac{1}{6}$	$8\frac{7}{10}$ $2\frac{1}{2}$	$9\frac{3}{5}$ $2\frac{3}{10}$



A $1\frac{1}{2}$ B How many quarters? C $1\frac{1}{2} - \frac{3}{4} = ?$

Another Step in Subtracting Unlike Fractions

1. There were $1\frac{1}{2}$ pies on the table. The cook cut them into quarters. For supper she served 3 of the quarters ($\frac{3}{4}$). What part of a pie remained? $1\frac{1}{2} - \frac{3}{4} = ?$

   Use your cut-outs to find $1\frac{1}{2} - \frac{3}{4}$.

2. Use the drawings to explain how to find $1\frac{1}{2} - \frac{3}{4}$.

$$\begin{array}{rcrcr} 1\frac{1}{2} & = & 1\frac{2}{4} & = & \frac{6}{4} \\ -\frac{3}{4} & = & \frac{3}{4} & = & \frac{3}{4} \\ \hline & & & & \frac{3}{4} \end{array}$$

Why must we change $1\frac{1}{2}$ to $1\frac{2}{4}$?
Why can we not subtract $\frac{3}{4}$ from $1\frac{2}{4}$?
How do we change $1\frac{2}{4}$ to $\frac{6}{4}$?
What is the remainder?

3. Explain step by step how to work the examples below.

a. $$\begin{array}{rcrcr} 4\frac{1}{2} & = & 4\frac{4}{8} & = & 3\frac{12}{8} \\ -2\frac{5}{8} & = & 2\frac{5}{8} & = & 2\frac{5}{8} \\ \hline & & & & 1\frac{7}{8} \end{array}$$

b. $$\begin{array}{rcrcrcr} 7\frac{1}{6} & = & 7\frac{1}{6} & = & 6\frac{7}{6} & & \\ -2\frac{2}{3} & = & 2\frac{4}{6} & = & 2\frac{4}{6} & & \\ \hline & & & & 4\frac{3}{6} & = & 4\frac{1}{2} \end{array}$$

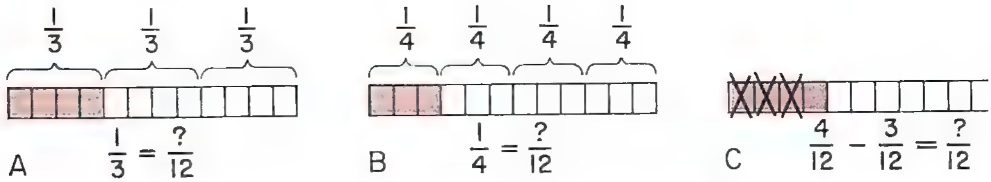
4. Give the missing numerators:

a. $5\frac{1}{4} = 5\frac{?}{8} = 4\frac{?}{8}$ b. $7\frac{1}{2} = 7\frac{?}{4} = 6\frac{?}{4}$ c. $8\frac{2}{3} = 8\frac{?}{6} = 7\frac{?}{6}$

Copy and subtract. Go over your work to check it.

	a	b	c	d	e	f	g
5.	$1\frac{1}{4}$ $\frac{1}{2}$	$5\frac{1}{4}$ $2\frac{3}{8}$	$1\frac{1}{2}$ $\frac{5}{8}$	$7\frac{1}{2}$ $2\frac{3}{4}$	$1\frac{1}{8}$ $\frac{3}{4}$	$8\frac{2}{3}$ $7\frac{5}{6}$	$1\frac{1}{3}$ $\frac{5}{6}$
6.	$2\frac{1}{2}$ $\frac{3}{4}$	$4\frac{1}{2}$ $3\frac{7}{8}$	$6\frac{1}{3}$ $2\frac{5}{6}$	$8\frac{3}{8}$ $4\frac{1}{2}$	$6\frac{3}{4}$ $3\frac{7}{8}$	$9\frac{1}{4}$ $7\frac{1}{2}$	$6\frac{2}{3}$ $3\frac{5}{6}$

MORE PRACTICE 348



Subtracting More Difficult Unlike Fractions

Let us use the drawings above to find $\frac{1}{3} - \frac{1}{4}$.

1. How many twelfths of A are brown? How many twelfths of B are brown? How many more twelfths are brown in A than in B? Use C to find out.

2. We find $\frac{1}{3} - \frac{1}{4}$ as shown below.

$$\begin{array}{rcr} \frac{1}{3} & = & \frac{4}{12} \\ -\frac{1}{4} & = & \frac{3}{12} \\ \hline & & \frac{1}{12} \end{array}$$

How do we find the common denominator?
How do we get the $\frac{1}{12}$?
How much more than $\frac{1}{4}$ is $\frac{1}{3}$?

3. Explain the work in the examples below.

a. $$\begin{array}{rcr} 3\frac{3}{4} & = & 3\frac{9}{12} \\ -2\frac{1}{3} & = & 2\frac{4}{12} \\ \hline & & 1\frac{5}{12} \end{array}$$

b. $$\begin{array}{rcr} 3\frac{1}{2} & = & 3\frac{5}{10} \\ -1\frac{1}{5} & = & 1\frac{2}{10} \\ \hline & & 2\frac{3}{10} \end{array}$$

c. $$\begin{array}{rcr} 4\frac{1}{4} & = & 4\frac{3}{12} \\ -4\frac{1}{6} & = & 4\frac{2}{12} \\ \hline & & \frac{1}{12} \end{array}$$

4. Copy the three examples above and subtract.

Copy the examples below and subtract.

MORE PRACTICE 349

	a	b	c	d	e	f	g
5.	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{1}{6}$
	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{2}{5}$	$\frac{3}{4}$	$\frac{1}{8}$
6.	$5\frac{1}{3}$	$6\frac{2}{3}$	$7\frac{3}{4}$	$8\frac{3}{4}$	$6\frac{1}{2}$	$4\frac{1}{4}$	$5\frac{3}{8}$
	$2\frac{1}{4}$	$1\frac{1}{2}$	$6\frac{2}{3}$	$2\frac{3}{5}$	$1\frac{1}{5}$	$2\frac{1}{6}$	$1\frac{1}{6}$

Practice What You Have Learned

1. $25\overline{)10,000}$
2. $92\overline{)9734}$
3. $46\overline{)4270}$
4. $39\overline{)3062}$
5. $16\overline{)8128}$
6. $85\overline{)4832}$
7. $58\overline{)5162}$
8. $35\overline{)11,690}$
9. $87\overline{)40,716}$
10. $2\frac{1}{2} + 3\frac{3}{4} =$
11. $5\frac{1}{4} - 3\frac{1}{2} =$
12. $7\frac{3}{4} + 4\frac{5}{6} =$

Subtracting More Difficult Mixed Numbers

1. Alice had $4\frac{1}{4}$ yards of white lace and $2\frac{1}{3}$ yards of yellow lace. How much more white lace had she than yellow lace?

$$\begin{array}{rcrcr} 4\frac{1}{4} & = & 4\frac{3}{12} & = & 3\frac{15}{12} \\ \underline{-2\frac{1}{3}} & = & \underline{2\frac{4}{12}} & = & \underline{2\frac{4}{12}} \\ & & & & 1\frac{11}{12} \end{array}$$

Why must we first change both fractions to twelfths?

Why do we change $4\frac{3}{12}$ to $3\frac{15}{12}$? Explain how.

What is the answer to the problem?

2. Explain each step in the work below.

a. $$\begin{array}{rcrcr} 4\frac{2}{3} & = & 4\frac{8}{12} & = & 3\frac{20}{12} \\ \underline{-1\frac{3}{4}} & = & \underline{1\frac{9}{12}} & = & \underline{1\frac{9}{12}} \\ & & & & 2\frac{11}{12} \end{array}$$

b. $$\begin{array}{rcrcr} 8\frac{1}{6} & = & 8\frac{2}{12} & = & 7\frac{14}{12} \\ \underline{-2\frac{1}{4}} & = & \underline{2\frac{3}{12}} & = & \underline{2\frac{3}{12}} \\ & & & & 5\frac{11}{12} \end{array}$$

3. Copy and work the three examples above with your book closed. Check your work.

Subtract. Go over your work to check it.

	a	b	c	d	e	f	g
4.	$1\frac{1}{2}$ $\underline{\frac{2}{3}}$	$1\frac{1}{4}$ $\underline{\frac{1}{3}}$	$1\frac{1}{3}$ $\underline{\frac{1}{2}}$	$1\frac{1}{4}$ $\underline{\frac{5}{6}}$	$1\frac{1}{6}$ $\underline{\frac{7}{8}}$	$1\frac{1}{2}$ $\underline{\frac{3}{5}}$	$1\frac{2}{3}$ $\underline{\frac{3}{4}}$
5.	$7\frac{1}{4}$ $\underline{2\frac{1}{3}}$	$8\frac{1}{2}$ $\underline{2\frac{3}{5}}$	$6\frac{1}{2}$ $\underline{1\frac{2}{3}}$	$3\frac{1}{6}$ $\underline{2\frac{7}{8}}$	$9\frac{2}{3}$ $\underline{8\frac{3}{4}}$	$7\frac{1}{3}$ $\underline{2\frac{1}{2}}$	$6\frac{1}{4}$ $\underline{2\frac{5}{6}}$
6.	$7\frac{1}{2}$ $\underline{4\frac{3}{4}}$	$8\frac{1}{3}$ $\underline{1\frac{1}{4}}$	$8\frac{1}{4}$ $\underline{2\frac{3}{4}}$	$6\frac{7}{8}$ $\underline{2\frac{1}{2}}$	$7\frac{1}{2}$ $\underline{2\frac{3}{5}}$	$7\frac{1}{2}$ $\underline{4\frac{7}{10}}$	$7\frac{1}{4}$ $\underline{5\frac{5}{6}}$

MORE PRACTICE 349

7. A plane can fly from Hopetown to Newport in $1\frac{1}{2}$ hours. It takes a train $6\frac{1}{5}$ hours to make the trip. How much longer does it take the train than the plane?

8. How much less than $4\frac{1}{6}$ feet is $2\frac{1}{4}$ feet?

How Much Cloth for a Dress?

Betty has a pattern for a new dress. The dress is to be size 10. The pattern shows the amounts of cloth of different widths needed for the blouse and skirt.

Width of Cloth	Blouse	Skirt
35-inch cloth	$1\frac{5}{8}$ yd.	$2\frac{7}{8}$ yd.
39-inch cloth	$1\frac{1}{2}$ yd.	$2\frac{5}{8}$ yd.
54-inch cloth	1 yd.	$1\frac{3}{4}$ yd.

1. For what widths does the pattern tell the number of yards of cloth needed?

2. How many yards of 35-inch cloth are needed for the blouse? for the skirt? for both the blouse and skirt?

3. How many yards of 39-inch cloth are needed for the blouse and skirt? How many yards of 54-inch cloth?

4. How many more yards of 35-inch cloth are needed for the skirt than for the blouse?

5. How many more yards of 35-inch cloth are needed for the blouse and skirt than of 39-inch cloth?

6. Betty has a piece of 39-inch cloth that is $3\frac{1}{2}$ yards long. How much more cloth does she need for the dress?

7. How much more than a yard wide is the 54-inch cloth?

8. How much more than a foot is the difference in the widths of 54-inch cloth and 35-inch cloth?

★9. Why are the widths of the cloth not given in yards?

A Good Way to Save Money

The sign shows how much the prices of boys' and girls' coats were reduced at a sale. Why are prices reduced at a sale?

BIG SALE
ALL PRICES REDUCED
BOYS' COATS $\frac{1}{3}$ OFF
GIRLS' COATS $\frac{1}{4}$ OFF
BIG BARGAINS

1. Bobby is going to buy a coat costing \$18.75. How much will the price of the coat be reduced?

Think: Reduction = $\frac{1}{3}$ of \$18.75, or $3\overline{)\$18.75}$

2. How much will Bobby pay for the coat? We call this amount the **sale price.**

3. Find the sale price of an \$18.00 girl's coat at the reduction shown in the sign above.

4. Find the sale price of the following:

a. A boy's coat, regular price, \$15.75

b. A girl's coat, regular price, \$16.80

c. A boy's coat, regular price, \$14.85

d. A girl's coat, regular price, \$18.40

5. Patty bought five 25-cent handkerchiefs that were on sale at 15 cents each. How much did she save? Tell two ways to find the answer.

6. How much is saved by buying 6 yards of cloth, usually \$.80 a yard, on sale at $\frac{1}{5}$ off? Tell two ways to find the answer.

★7. Bring to class an advertisement of a sale. Tell how the reductions are expressed.

★8. Find out when stores most often have sales.

Finding Errors in Subtraction of Fractions

Find what is wrong or incomplete in each example. Then work the example correctly.

1. $\begin{array}{r} \frac{5}{8} \\ -\frac{3}{8} \\ \hline \frac{2}{8} \end{array}$	2. $\begin{array}{r} 9\frac{5}{6} \\ -4\frac{1}{6} \\ \hline 4\frac{4}{6} = \frac{2}{3} \end{array}$	3. $\begin{array}{r} 3\frac{1}{3} \\ -\frac{1}{3} \\ \hline 30 \end{array}$	4. $\begin{array}{rcr} 6\frac{1}{4} & = & 5\frac{11}{4} \\ -\frac{3}{4} & = & \frac{3}{4} \\ \hline & & 5\frac{8}{4} = 7 \end{array}$
5. $\begin{array}{r} 7\frac{1}{3} \\ -2\frac{2}{3} \\ \hline 5\frac{1}{3} \end{array}$	6. $\begin{array}{rcr} 4\frac{1}{4} & = & 3\frac{5}{4} \\ -3\frac{1}{4} & = & 3\frac{1}{4} \\ \hline & & \frac{4}{4} \end{array}$	7. $\begin{array}{r} 8 \\ -3\frac{3}{10} \\ \hline 5 \end{array}$	8. $\begin{array}{rcr} 8\frac{1}{4} & = & 8\frac{1}{12} \\ -4\frac{1}{3} & = & 4\frac{3}{12} \\ \hline & & 3\frac{1}{12} \end{array}$

Practice in Subtracting Fractions

Work carefully and try to have every example correct.

	a	b	c	d	e	f	g
1.	$\begin{array}{r} \frac{3}{4} \\ \frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{2} \\ \frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{3}{8} \\ 2\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{2} \\ 6\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{7}{8} \\ 1\frac{1}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{7}{8} \\ \frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 1\frac{1}{4} \\ \frac{3}{4} \\ \hline \end{array}$
2.	$\begin{array}{r} 4\frac{5}{6} \\ 2\frac{1}{3} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ \frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 1\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{2} \\ 4\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{1}{8} \\ 5\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{1}{4} \\ 3\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{2} \\ 2\frac{3}{4} \\ \hline \end{array}$
3.	$\begin{array}{r} \frac{1}{3} \\ \frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{6} \\ \frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{2}{5} \\ 3\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{3} \\ 4\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{1}{2} \\ 7\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{2} \\ 4\frac{1}{10} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{2} \\ \frac{1}{6} \\ \hline \end{array}$

Practice What You Have Learned

	a	b	c	d	e
1.	$\begin{array}{r} 986 \\ \times 74 \\ \hline \end{array}$	$43\overline{)25,972}$	$\begin{array}{r} 5\frac{3}{4} \\ +3\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{2}{3} \\ +6\frac{5}{6} \\ \hline \end{array}$	$29\overline{)13,920}$
2.	$\begin{array}{r} 8\frac{1}{4} \\ -2\frac{3}{4} \\ \hline \end{array}$	$\frac{1}{4}$ of 173 =	$\begin{array}{r} 8\frac{7}{8} \\ +6\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{1}{3} \\ -5\frac{1}{3} \\ \hline \end{array}$	$86\overline{)68,284}$
3.	$\begin{array}{r} 8\frac{5}{6} \\ -4\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 80,000 \\ -19,608 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{5}{6} \\ +6\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{2} \\ -1\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 8060 \\ \times 96 \\ \hline \end{array}$

Diagnostic Test in Subtraction of Unlike Fractions

First repeat the diagnostic test in subtraction of like fractions on page 87. Correct all errors.

Then copy and subtract.

	a	b	c	d	e	
1.	$\begin{array}{r}\frac{1}{2}\\ \underline{\frac{1}{4}}\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{1}{8}}\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \underline{\frac{1}{2}}\end{array}$	$\begin{array}{r}\frac{7}{8}\\ \underline{\frac{3}{4}}\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{1}{2}}\end{array}$	(110)
2.	$\begin{array}{r}6\frac{1}{4}\\ \underline{2\frac{1}{8}}\end{array}$	$\begin{array}{r}8\frac{1}{2}\\ \underline{2\frac{1}{4}}\end{array}$	$\begin{array}{r}6\frac{7}{8}\\ \underline{2\frac{1}{2}}\end{array}$	$\begin{array}{r}6\frac{3}{4}\\ \underline{5\frac{3}{8}}\end{array}$	$\begin{array}{r}5\frac{5}{6}\\ \underline{2\frac{1}{3}}\end{array}$	(110)
3.	$\begin{array}{r}7\frac{1}{2}\\ \underline{6\frac{3}{4}}\end{array}$	$\begin{array}{r}7\frac{1}{4}\\ \underline{2\frac{1}{2}}\end{array}$	$\begin{array}{r}6\frac{3}{8}\\ \underline{4\frac{3}{4}}\end{array}$	$\begin{array}{r}8\frac{1}{2}\\ \underline{5\frac{5}{8}}\end{array}$	$\begin{array}{r}7\frac{1}{3}\\ \underline{2\frac{5}{6}}\end{array}$	(111)
4.	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{1}{3}}\end{array}$	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{1}{2}}\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{1}{5}}\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{1}{6}}\end{array}$	$\begin{array}{r}\frac{7}{8}\\ \underline{\frac{5}{6}}\end{array}$	(112)
5.	$\begin{array}{r}6\frac{2}{3}\\ \underline{5\frac{3}{4}}\end{array}$	$\begin{array}{r}6\frac{1}{2}\\ \underline{4\frac{2}{3}}\end{array}$	$\begin{array}{r}9\frac{3}{5}\\ \underline{8\frac{1}{4}}\end{array}$	$\begin{array}{r}7\frac{7}{8}\\ \underline{4\frac{5}{6}}\end{array}$	$\begin{array}{r}8\frac{3}{4}\\ \underline{5\frac{5}{6}}\end{array}$	(113)

Turn for help to the page given at the right of the row.

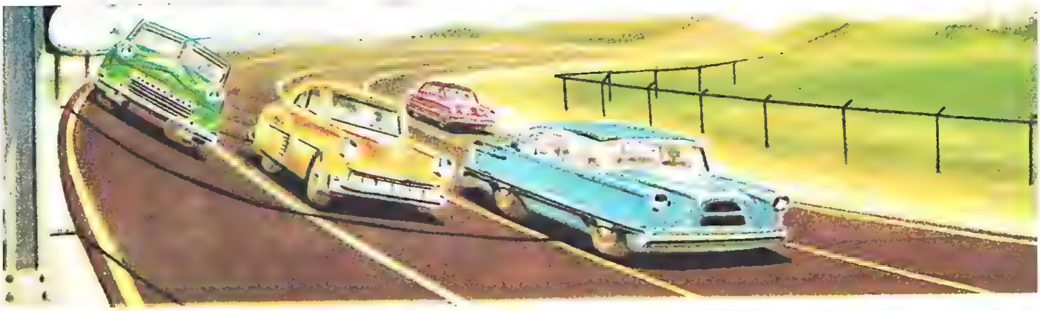
Checking Up

Work the first two examples in each row in the following diagnostic tests in fractions to check up on the work we have had.

1. Addition of like fractions, page 87.

2. Addition of unlike fractions, page 108.

Work also the first two examples in each row in the diagnostic tests in division on pages 32 and 70.



The Faster We Go, the More Gasoline We Use

Speeds in Miles an Hour	Miles to the Gallon
30	29
40	25
50	23
60	20

The list shows the number of miles one automobile made on a gallon of gasoline at four different speeds.

1. How many miles did the car go on a gallon of gasoline at 30 miles an hour? at 60 miles an hour?

2. Suppose that gasoline cost 30 cents a gallon. What was the cost of gasoline used to go a mile at 60 miles an hour?

   Think: The cost of 1 gallon is 30¢. The car averages 20 miles a gallon at a speed of 60 miles an hour. $30¢ \div 20 = ?$

3. At 30 cents a gallon what is the cost of the gasoline used to go one mile at 40 miles an hour? at 50 miles an hour? at 30 miles an hour? At which speed is the cost the least?

★4. How much gasoline would the car use in going 100 miles at the rate of 40 miles an hour?

★5. At 30 cents a gallon, what would the gasoline cost to go 200 miles at 40 miles an hour?

★6. Prove that safe driving is economical driving.

Explain the Meaning of These Words

budget	estimate	quotient	tens' place
denominator	numerator	round off	terms
dividend	product	sum	value

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	532	7224	5731	9104	2386
	616	8980	404	6783	7775
	863	5625	4968	8860	3673
	197	6953	491	569	7524
	708	9708	5857	9490	9796
2.	$4\frac{1}{4}$	$5\frac{1}{2}$	$6\frac{3}{4}$	$6\frac{1}{4}$	$6\frac{2}{3}$
	$1\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{5}{6}$
	$3\frac{1}{4}$	6	$5\frac{3}{4}$	$2\frac{1}{8}$	$4\frac{5}{6}$

Practice Test in Subtraction

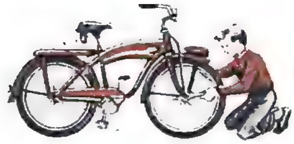
	a	b	c	d	e
1.	9412	12,134	71,056	\$602.09	\$500.80
	2649	8,359	32,576	537.40	429.81
2.	$\frac{3}{4}$	$7\frac{2}{3}$	$6\frac{1}{2}$	8	$1\frac{3}{8}$
	$\frac{1}{4}$	$1\frac{1}{3}$	$\frac{1}{2}$	$2\frac{3}{4}$	$\frac{7}{8}$
3.	$6\frac{1}{4}$	$7\frac{1}{2}$	$9\frac{3}{8}$	$4\frac{3}{4}$	$6\frac{3}{4}$
	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{2}{3}$	$6\frac{1}{6}$

Practice Test in Multiplication

	a	b	c	d	e
1.	970	645	\$6.57	365	\$60.80
	6	5	9	20	8
2.	849	9007	798	\$91.75	\$8.56
	129	70	451	308	670

Practice Test in Division

	a	b	c	d	e
1.	$15\overline{)1200}$	$29\overline{)2325}$	$48\overline{)4320}$	$56\overline{)4200}$	$\frac{1}{6}$ of \$1.44 =
2.	$26\overline{)2061}$	$67\overline{)2881}$	$96\overline{)82{,}560}$	$48\overline{)3744}$	$79\overline{)10{,}191}$



Checking on Important Points

1. Write two like fractions whose sum is less than 1; equal to 1; greater than 1.

2. Write two unlike fractions whose sum is less than 1; equal to 1; greater than 1.

$\frac{1}{5}$	$\frac{1}{3}$	$\frac{1}{6}$

3. Which of the fractions in the box is more than $\frac{1}{4}$ but less than $\frac{1}{2}$?

4. Which fraction has the smallest value: $\frac{1}{4}$, $\frac{1}{6}$, or $\frac{1}{16}$?

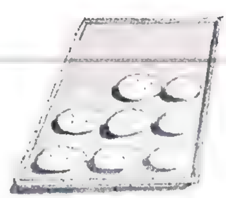
5. Tell how to find the common denominator of the fractions in each example below. Then find the sums.

a. $\begin{array}{r} \frac{1}{2} \\ \underline{\frac{7}{8}} \end{array}$ b. $\begin{array}{r} \frac{1}{2} \\ \underline{\frac{1}{3}} \end{array}$ c. $\begin{array}{r} \frac{3}{4} \\ \underline{\frac{5}{6}} \end{array}$

6. How can you tell that $\frac{1}{2} + \frac{3}{4}$ is more than 1?

7. How can you find out which fraction has the greater value, $\frac{3}{4}$ or $\frac{7}{8}$? What is the difference in their values?

8. Explain the steps in subtracting $2\frac{2}{3}$ from $4\frac{1}{2}$.



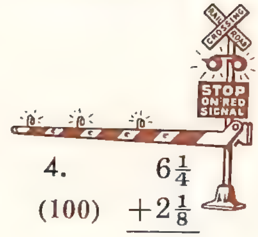
9. $\frac{1}{5}$ hour is how many minutes?

10. What part of a dozen are the cookies at the right?

11. At 60 cents a pound how many pounds of butter can you buy for 90 cents?

12. Tell what the correct first quotient figure is in each example below. Tell where to write it. Then divide.

a. $32\overline{)9467}$ b. $29\overline{)2496}$ c. $43\overline{)8953}$ d. $18\overline{)14,382}$



Progress Test III

1. (10) 689, 3428, 97, 485, 3898
2. (15) $12{,}000 - 9{,}108$
3. (91) $6\frac{1}{2} + 5\frac{1}{2}$
4. (100) $6\frac{1}{4} + 2\frac{1}{8}$
5. (100) $7\frac{1}{2} + 2\frac{3}{4}$
6. (104) $8\frac{2}{3} + 6\frac{3}{4}$
7. (93) $7\frac{3}{4} - 2\frac{1}{4}$
8. (95) $8\frac{1}{4} - 1\frac{3}{4}$
9. (94) $7 - 2\frac{3}{4}$
10. (110) $3\frac{1}{2} - 2\frac{1}{4}$
11. (111) $4\frac{7}{8} - 2\frac{3}{4}$
12. (111) $5\frac{1}{2} - 4\frac{5}{6}$
13. (113) $6\frac{1}{3} - 1\frac{3}{4}$
14. (19) 97×80
15. (19) $\$8.49 \times 97$
16. (60) $28\overline{)2157}$
17. (31) $53\overline{)2206}$
18. (28) $\frac{1}{4}$ of 93
19. (66) $15\overline{)6450}$
20. Find the sum of $7\frac{3}{4}$ and $8\frac{5}{6}$. (105)

For help, turn to the page given with the example.

★For Those with No Work to Correct

Find the missing numbers in the following statements:

1. $14 + 12 = 30 - ?$
2. $16 - 10 = 2 \times ?$
3. $30 + ? = 60 - 18$
4. $8 \times 5 = 160 \div ?$
5. $? \times 6 = 68 + 4$
6. $140 \div 28 = 48 - ?$
7. $? - 50 = 10 \times 8$
8. $30 - 24 = ? \div 12$
9. $40 - ? = 4 \times 3$
10. $? \div 16 = 8 \times 20$
11. $1\frac{1}{2} + 3\frac{1}{2} = 8 - ?$
12. $4\frac{1}{4} - 3\frac{1}{4} = 15 - ?$
13. $5 \times 8 = 4 \times ?$
14. $30 \div 2 = 60 \div ?$
15. $8\frac{1}{2} - ? = 3\frac{1}{4} + 4\frac{1}{8}$
16. $? + 4\frac{3}{4} = 12 - 3\frac{1}{2}$
17. $5\frac{1}{3} + ? = 12\frac{1}{2} - 4\frac{1}{6}$
18. $5\frac{3}{4} + 6\frac{2}{3} = 10\frac{1}{2} + ?$
19. $7\frac{2}{3} - 4\frac{5}{6} = 17\frac{2}{3} - ?$
20. $136 \div 17 = 12\frac{1}{2} - ?$

Test in Problem Solving III

1. Arthur spends on the average 24 cents a day for lunch at school. How much does he spend in 20 days?

2. If 3 pounds of butter cost \$2.67, how much is the cost of butter a pound?

3. At 3 cans for 58 cents, how much do 6 cans of soup cost?

4. Bobby has 4 puppies. Their total weight is 10 pounds. What is their average weight?

5. Barbara weighs $87\frac{3}{4}$ pounds. Tom weighs $91\frac{1}{2}$ pounds. How much less than Tom does Barbara weigh?

6. At a $\frac{1}{4}$-off sale Joan bought a \$20 jacket. Find the sale price of the jacket.

7. A garden is 35 feet long and 20 feet wide. Find the cost of wire for a fence around it at 5 cents a foot.

8. Ann had 8 yards of ribbon. She cut off two pieces: one $2\frac{1}{4}$ yards long, the other $1\frac{3}{4}$ yards long. How long was the piece that was left?

9. Mr. Smith raised 2166 bushels of corn on a 38-acre field. What was the average number of bushels produced to the acre?

10. Mr. Brown bought a 24-box crate of raspberries for \$7.20. He sold them at 38 cents a box. How much more did he receive for the berries than he paid for them?

How many problems did you work correctly?

CHAPTER IV

Harnessing Mother Nature

	Height	Length
Fort Peck	250 ft.	21,026 ft.
Grand Coulee	550 ft.	4,173 ft.
Hoover	726 ft.	1,244 ft.
Norris	265 ft.	1,860 ft.

1. What is the height of Hoover Dam shown in the picture below? What is its length?

2. Which of the four dams is the highest? Which is the longest?

3. How much more is the height of Hoover Dam than of Grand Coulee? How much more than of Norris?

4. How much longer than Hoover Dam is Grand Coulee? How much longer than Hoover Dam is Fort Peck?

5. Which of the dams is less than $\frac{1}{4}$ mile long?

6. Which dam is nearest a mile long?

7. How much less than 4 miles long is Fort Peck?

8. How much less than three times as high as Fort Peck is Hoover Dam?

9. How much more than sixteen times as long as Hoover Dam is Fort Peck?

★10. Where are the dams named in the table?

U. S. Dept. of Interior, Bureau of Reclamation

How Well Can You Estimate Distances?

Miss Smith said to the children, "Let us see how well you can estimate distances. Use the stiff edge of a card or book. Draw a line that you think is 4 inches long." When the children finished, she said, "Now measure your line with your ruler. How long is it?"

Here are measurements nine children reported:

a.	Helena	$4\frac{1}{2}$ in.	d.	Grace	$5\frac{1}{4}$ in.	g.	Ann	$3\frac{1}{8}$ in.
b.	Bob	$4\frac{3}{4}$ in.	e.	Tom	4 in.	h.	Arthur	$5\frac{3}{8}$ in.
c.	George	$3\frac{1}{2}$ in.	f.	Barbara	$5\frac{1}{2}$ in.	i.	Patty	$2\frac{7}{8}$ in.

1. Which children drew lines that were too long? How much too long was each of the lines?

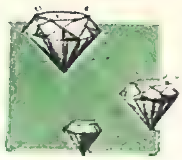
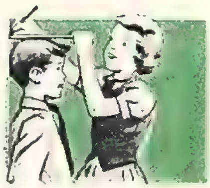
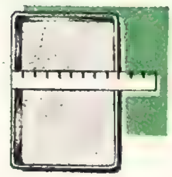
2. Which children drew lines that were too short? How much too short was each of the lines?

3. What was the difference in the lengths of the longest and shortest lines drawn by the children?

4. Use the edge of a stiff card to draw a line that you think is 3 inches long. Then measure the line. Who in the class has the smallest error in the length of the line? Why is it not easy to draw a line **exactly** 1 inch long?

5. Place two marks on the blackboard that you think are one yard apart. Measure the distance between the pairs of marks with a foot ruler. Why is this not easy to do?

★6. Estimate the width of your classroom; then measure it.

Everyday Measurements

We must measure very accurately in measuring the time in a race or the weight of precious stones. We need not measure so accurately in finding the height of a room or the weight of a child. All measures are **approximate.** They cannot be **exact.**

1. Suppose that a boy is $58\frac{1}{4}$ inches tall. We can say that to the nearest inch he is 58 inches tall. When someone is $58\frac{1}{2}$ inches or $58\frac{3}{4}$ inches tall, to the nearest inch he is 59 inches tall.

2. Give the following measures correct to the nearest inch:

a. $4\frac{1}{4}$ in. b. $16\frac{7}{8}$ in. c. $29\frac{1}{2}$ in. d. $46\frac{3}{8}$ in. e. $52\frac{5}{8}$ in. f. $68\frac{3}{4}$ in.

3. Give the following correct to the nearest pound:

a. $2\frac{3}{4}$ lb. b. $5\frac{1}{8}$ lb. c. $2\frac{1}{2}$ lb. d. 2 lb. 1 oz. e. 4 lb. 14 oz.

4. To the nearest dollar \$3.06 is \$3. To the nearest dollar \$4.90 is \$5. Give the following to the nearest dollar:

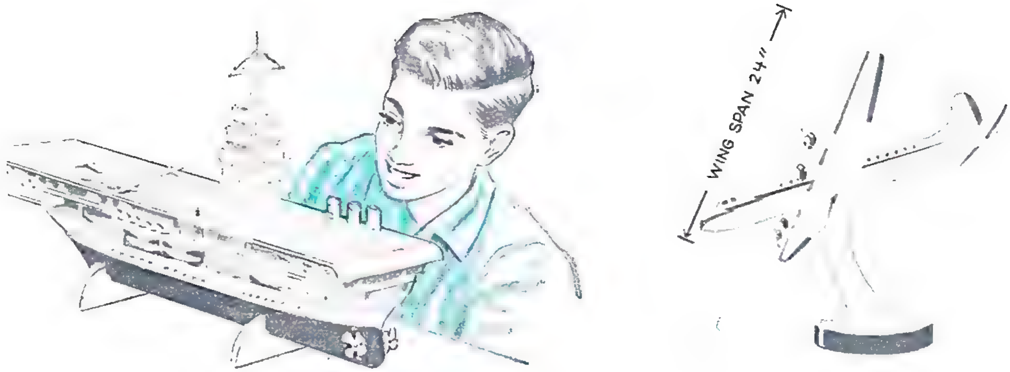
a. \$6.12 b. \$7.86 c. \$9.04 d. \$5.36 e. \$8.79

5. Why should we not measure to the nearest inch a pane of glass to be bought? Why do we need fractions of an inch?

★ 6. Why do we not give the time required to run a mile in a race to the nearest minute?

★ 7. Find your height to the nearest inch and your weight to the nearest pound. Why can you not find your **exact** height?

★ 8. Find out how diamonds and drugs are weighed.



Flying Model Airplanes

1. The scale-model carrier deck in the picture is 50 inches long and 6 inches wide. The real deck of which it is a model is 120 times as long and wide. What are the dimensions of the real deck?

2. Bob bought 2 model biplanes for 59 cents each and a model Skymaster for 79 cents. How much did these planes cost?

3. The Skymaster had a 24-inch wing span. How many feet was the wing span? How much less than a yard was it?

4. The Skymaster was of balsa wood and weighed $2\frac{1}{2}$ ounces. How much less than a pound was this?

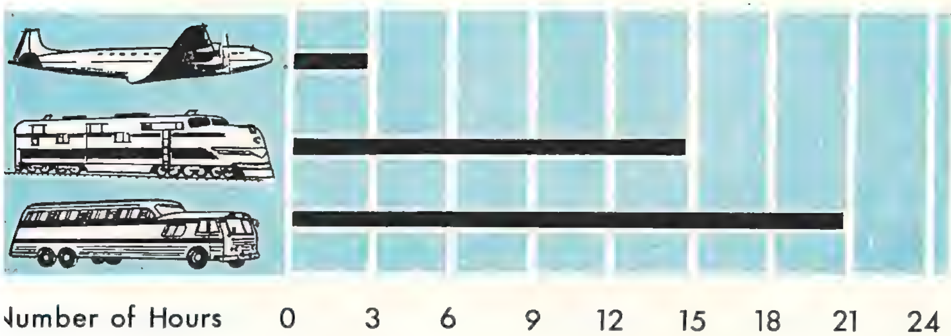
5. One of Bob's planes flew for 45 seconds. How much more than $\frac{1}{2}$ minute was this?

6. Tom has a featherweight model plane that flew for $26\frac{1}{2}$ minutes. How much less than $\frac{1}{2}$ hour was this?

7. The propeller of a model airplane made 18,000 revolutions a minute. How many revolutions was this a second?

8. This model airplane flew 20 miles at the rate of 105 miles an hour. How many miles a minute was this speed?

★ 9. Why does our government encourage people to make and fly model airplanes?



Two Ways of Comparing Numbers

The graph shows how long it takes to go from Chicago to New York by airplane, bus, and rail.

1. How long does it take by airplane? by rail? by bus?

2. How many hours less does it take by airplane than by rail? How many hours less than by bus?
In problem 2 we compare two numbers by **subtraction.**

3. How many times as long did it take to make the trip by bus as by airplane? How many times as long as by rail?
In problem 3 we compare two numbers by **division.**

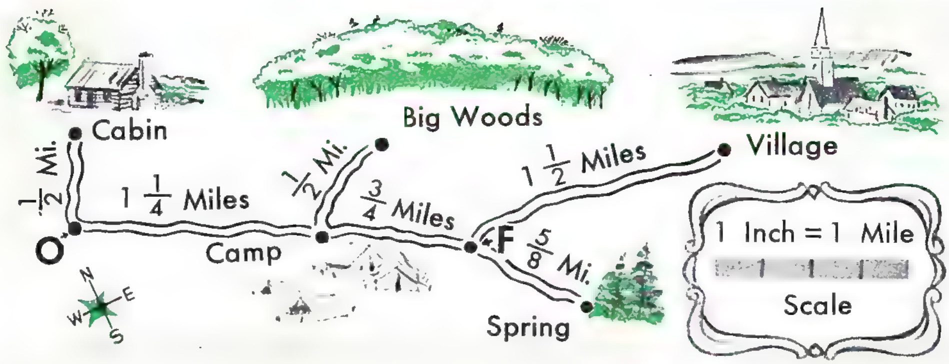
4. Compare each pair of numbers below by subtraction.

a. 40 and 5 b. 24 and 12 c. 50 and 20 d. 140 and 28

5. Compare each pair of numbers above by division.

Practice What You Have Learned

	a	b	c	d	e	f
1.	$4\frac{1}{2} + 2\frac{1}{2}$	984×20	$7 - 4\frac{3}{4}$	$6\frac{1}{4} + 4\frac{7}{8}$	$7004 - 2095$	$24\overline{)715}$
2.	$\$9.48 \times 59$	$83\overline{)5810}$	$8\frac{1}{3} + 4\frac{3}{4}$	$16\overline{)832}$	$6\frac{3}{4} - 4\frac{1}{2}$	$\$8.07 \times 86$
3.	$9\frac{1}{8} - 2\frac{1}{2}$	57×10	$48\overline{)43{,}536}$	$7\frac{3}{4} - 4\frac{5}{6}$	$57\overline{)50{,}103}$	$8\frac{4}{5} + 2\frac{7}{10}$



Using a Map Scale

1. This map is drawn to the scale of 1 inch = 1 mile. How many miles does a $1\frac{1}{4}$-inch line on the map stand for?

2. Measure with your ruler the distance on the map from the camp to the corner at **O**. Is the map correctly drawn? Check also several other distances on the map.

3. How far is it by road from the camp to the village?

4. How far is it from the camp to the spring?

5. How much nearer the fork in the road at **F** is the spring than the village?

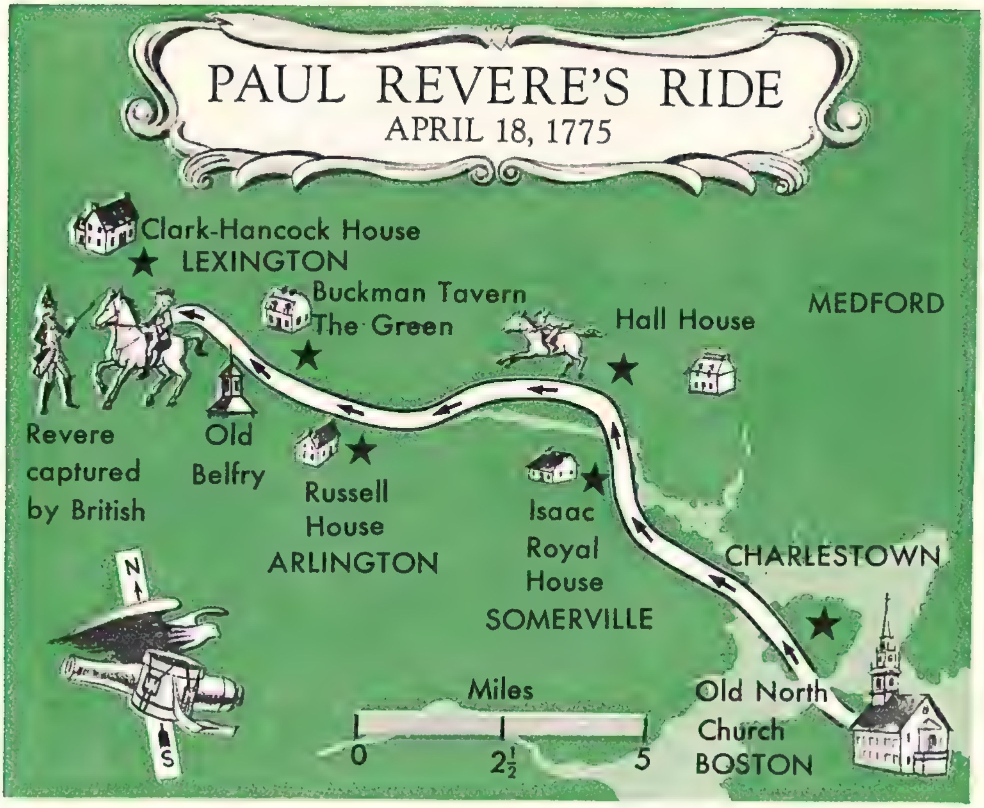
6. How much farther is it from the camp to **O** than to **F**?

7. Which is farther from the camp, the village or the cabin? How much farther?

8. How long a hike would it be by road from the camp to the village and back to the camp?

9. A group hiked from the camp to the big woods and back in the morning. They hiked from the camp to the spring and back in the afternoon. What was the total distance the group hiked?

★10. Find a map. See to what scale it is drawn. Why are the scales to which maps are drawn not all the same?



The Map of Paul Revere's Ride

1. On what date did Paul Revere's ride take place?

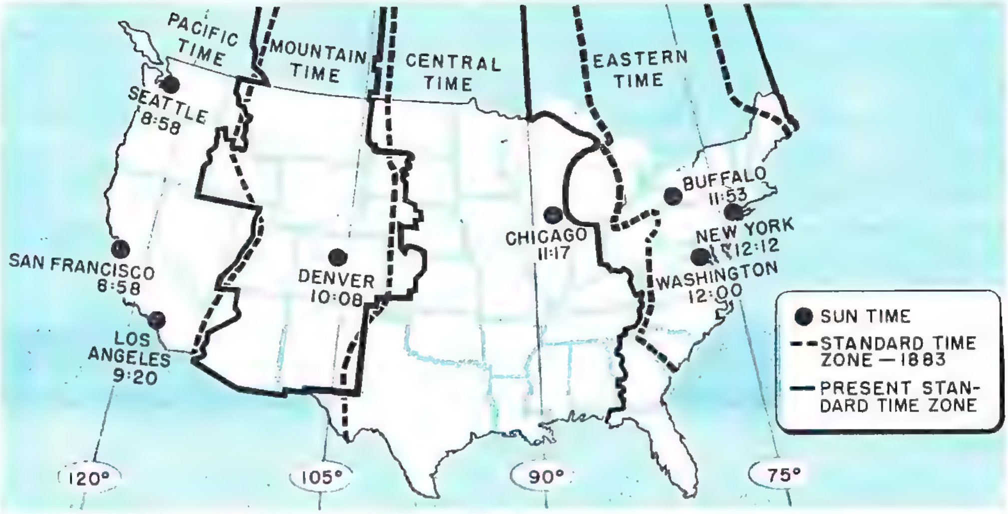
2. Where did the ride begin? Where did it end?

3. On the edge of a stiff card mark off the scale to which the map is drawn. Use your ruler to show that the scale is about $3\frac{1}{3}$ miles to 1 inch.

4. Use the scale on your card. Find how far it is to the nearest mile from Old North Church to Somerville. Why is it not easy to find the distance on the map?

5. The total length of the ride was about 16 miles. About how many miles was it from Old North Church to Old Belfry?

★6. In what direction from Boston is Lexington?



Times Do Change

Before 1883, people used "sun" time. It was 12 o'clock in each place when the sun was directly overhead.

1. On a line east and west of Chicago there is a change of 1 minute in sun time for each 13 miles. How many miles west of Chicago is a city in which the time is 20 minutes earlier? Why is sun time earlier there than in Chicago?

2. Suppose it is 12 o'clock noon sun time in Chicago. What time is it sun time 130 miles west of Chicago? 130 miles east of Chicago?

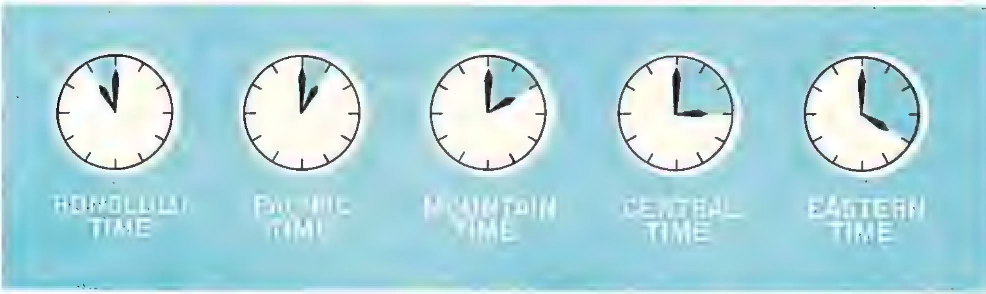
3. How far apart are two cities east of Chicago when the difference in their sun time is 15 minutes?

4. Why was it difficult for railroads to operate when each place had its own time?

5. In 1883, the railroads of the United States adopted the plan of dividing the country into zones. In each zone all places had the same time. Congress did not make the plan legal until March, 1918. The map shows sun time in several cities when it was 12 o'clock sun time in Washington, D. C. What time was it then in San Francisco? in Denver? in Chicago? in Buffalo?

6. How much earlier was it in San Francisco than in Washington? How much earlier than in Chicago?

7. The dotted lines in the map show how the railroads divided the country into zones. How many zones were there? What were their names? The solid lines show the zones as of today. In which zone do you live?



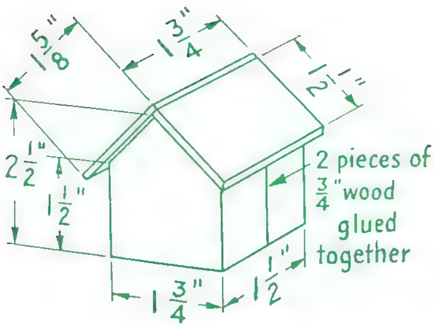
8. The clock faces show what time it is, standard time, in each zone when it is 4 o'clock in Washington, D. C. How many hours earlier is it in Pacific Time than in Mountain Time? than in Central Time? than in Eastern Time?

9. When it is 12 o'clock standard time in San Francisco, what time is it in Denver? in Chicago? in Washington?

10. A football game in Los Angeles begins there at 2 o'clock standard time. At what time should a boy in New York tune in the radio to hear the start of the game?

★11. Here is a part of an advertisement of an airplane trip from New York to Seattle. How long does the trip take?

Making a Toy House



TOY HOUSE

The diagram at the left is a scale drawing showing the measurements of a toy house.

1. The body is made of 2 pieces of lumber $\frac{3}{4}$ inch thick glued together. How wide is the side wall?

2. How high are the side walls of the house?

3. How wide is the end wall of the house facing us? How high is it to the place where the two parts of the roof meet?

4. How much higher is the end wall than the side wall?

5. How much wider is the end wall than the side wall?

6. What are the length and width of the right-hand side of the roof? the left-hand side of the roof?

★ 7. Why are house plans drawn to scale?

Practice What You Have Learned

	a	b	c	d	e	f
1.	74×30	$6\frac{3}{4} + 5\frac{3}{4}$	$18\overline{)972}$	90×10	$8010 - 2563$	$36\overline{)2304}$
2.	$7\frac{1}{4} - 2\frac{3}{4}$	$69\overline{)6003}$	$8\frac{1}{2} + 4\frac{5}{6}$	$8\frac{1}{3} - 2\frac{1}{6}$	$75\overline{)30,600}$	$6\frac{1}{2} + 3\frac{1}{5}$
3.	$84\overline{)3066}$	$\$8.67 \times 58$	$27\overline{)6048}$	$7\frac{1}{8} - 2\frac{1}{2}$	8070×97	$45\overline{)16,560}$

4. Find the sum of \$75.64 + \$1.95 + \$.08 + \$378.97.

How Large Is a City Block?

1. The drawing gives the **dimensions** (the length and the width) of a city block. How long is the block? How wide?

2. There are 5,280 feet in a mile. How much less than $\frac{1}{4}$ mile is the length of the block? the width of the block?

3. How many feet are there in $\frac{1}{8}$ mile? How many blocks as long as the one above make a mile?

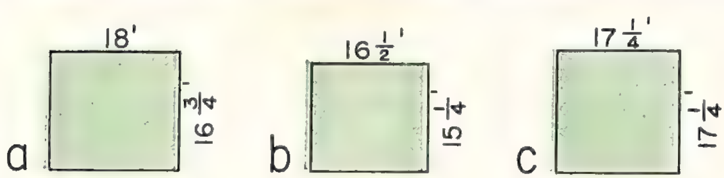
4. How many feet is it around the outer edge of the block? This is the **perimeter** of the block.

5. How much less than a mile is two times the perimeter of the block?

6. How can you tell that the block in which Tommy lives is not a **square**? How can you tell that it is a **rectangle**?

7. Find the perimeter of a 550 foot square field.

8. Which rectangle below has the greatest perimeter?



9. A school garden is 30 feet long and 25 feet wide. How much would a wire fence around it cost at 6 cents a foot?

10. What is the perimeter of a farm that is $\frac{3}{4}$ mile long and $\frac{1}{2}$ mile wide?

11. Draw a rectangle $2\frac{1}{2}$ inches by $1\frac{1}{4}$ inches. Find its perimeter.

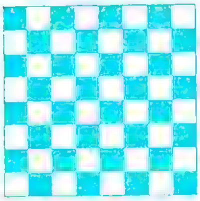
★12. Find the perimeter of the floor of your classroom.

Measuring Areas

To measure the amount of space there is in a surface we must know how to find its **area.**

1. The square at the right has an area of 1 **square inch.** What are its dimensions? Name some square surface that has an area of about 1 square inch (1 sq. in.).

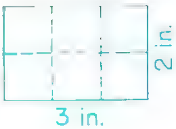
2. Each square in the checkerboard in the picture at the right represents 1 square inch. How many square inches are shown in 1 row of the squares?



3. How many rows of squares are there?

The number of squares in the checkerboard is 8×8, or 64. Its area is 64 square inches.

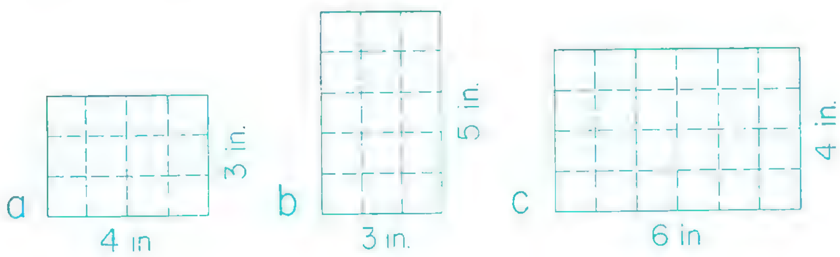
4. How many square inches are there in the rectangle pictured at the right?

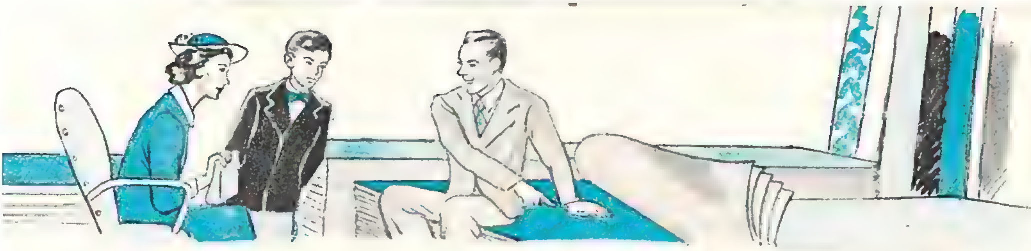


Think: There are 3 square inches in 1 row.
There are 2 rows of squares.
So there are 2×3 square inches in the rectangle.

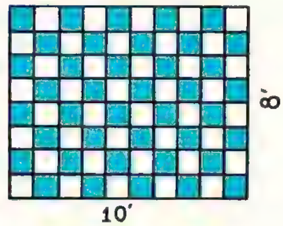
5. Draw a rectangle 2 inches by 3 inches. Divide it into 1-inch squares as shown in the drawing. How many square inches are there in your rectangle?

6. What is the area of each rectangle below?





Larger Measures of Area

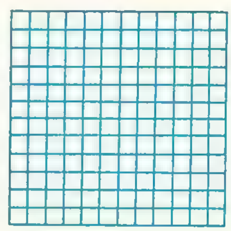


1. Each square block in the drawing represents a space 1 foot long and 1 foot wide. We say that the area of each square is 1 **square foot** (1 sq. ft.). Draw a square that is 1 foot long and 1 foot wide. Label it: 1 square foot. Name some square surface that has an area of 1 square foot.

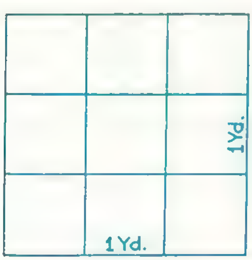
2. How many square feet are there in 1 row of squares in the floor? How many rows of squares are there?

3. How many square feet is the area of the floor?

Think: 8 × 10 sq. ft. = ? sq. ft.



4. The drawing at the right shows 1 square foot divided into square inches. How many square inches are there in 1 row? in 12 rows? 12 × 12 sq. in. = ?



5. Carpets and rugs are often sold by the **square yard**. The drawing at the left represents 1 square yard. How many feet long is it? How wide? Draw a square on the blackboard equal to 1 square yard. Label it: 1 sq. yd.

6. Divide the square yard into square feet, as shown in the drawing. How many square feet are there in 1 row? How many rows are there? How many square feet are there in 1 square yard?

Think: 3 × 3 sq. ft. = ? sq. ft.

7. How many square feet are there in a floor 12′ × 16′?

8. What is the area of a rug 5 yards long and 4 yards wide?

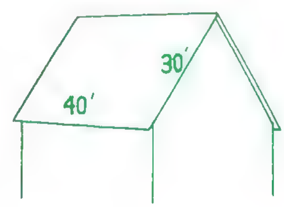
How Painters Estimate the Paint Needed

1. A gallon of paint will cover 600 square feet of surface. How much surface will 1 quart of paint cover? 1 pint? a half pint?

2. Show that a quart of paint is enough for the wall at the right.

3. A gallon of varnish is enough for 640 square feet. How much space will a quart of varnish cover? a pint? a half pint?

4. Show that for a floor 16 feet by 20 feet a half-gallon can of varnish is enough.



5. A gallon of oil paint is enough for one coat on 400 square feet of shingle roof. How many gallons are needed for the two sides of the roof shown at the right? Will 6 gallons be enough?

★6. Measure one wall or the floor of your classroom. Estimate the amount of paint needed for one coat.

Practice in Finding Perimeters and Areas

1. Draw a rectangle 4 inches long and 3 inches wide. Find its perimeter and also its area.

2. What is the perimeter of a floor that is 38 feet long and 24 feet wide? What is the area of the floor?

3. What is the area of a rug that is 6 yards long and 5 yards wide? What would the rug cost at $16.75 a square yard?

Multiplying by Hundreds

A. $10 \times 5 = 5$ tens, or 50. B. $100 \times 5 = 5$ hundreds, or 500.

1. Which example proves that writing one zero after a whole number multiplies the number by 10? Writing 0 after the 5 moves the 5 to tens' place.

2. Which example proves that writing two zeros after a whole number multiplies the number by 100? To what place is the 5 moved when we write two zeros after the 5? How much is 100×12?

3. Give the products of the following:

a. $10 \times 14 =$ b. $100 \times 8 =$ c. $100 \times 16 =$

4. How much is 200×134?

Think: $100 \times 134 = 13{,}400$. $2 \times 13{,}400 = 26{,}800$.

A quick way to multiply 134 by 200 is shown below.

A.
$$\begin{array}{r} 134 \\ \times 200 \\ \hline 00 \end{array}$$

B.
$$\begin{array}{r} 134 \\ \times 200 \\ \hline 26{,}800 \end{array}$$

There are no ones and no tens in 200 to multiply 134 by. So write 0 in ones' place and in tens' place in the product to hold these places. (See A.) Then multiply 134 by the 2 in hundreds' place as shown in B. Think: $2 \times 4 = 8$. Write 8 in hundreds' place in the product. How do we get the 6? How do we get the 2?

Find the products. Go over your work to check it.

	a	b	c	d	e	f
5.	431 300	813 400	908 900	807 700	178 800	809 600
6.	796 500	950 800	950 500	598 300	196 700	760 900
7.	507 90	860 70	685 86	539 500	900 400	789 32

MORE PRACTICE 350

Multiplying by Three-Place Numbers

Multiplying numbers like 143 × 216 is much like multiplying by two-place numbers.

Think of 143 as 100 + 40 + 3, or as 1 hundred, 4 tens, 3 ones. First multiply 216 by 3; then by 40; then by 100. Then add the products as shown below at the left.

Write this:

$$\begin{array}{r} 216 \\ \times 143 \\ \hline 648 \\ 8640 \\ 21600 \\ \hline 30{,}888 \end{array}$$

Think this:

A. $\begin{array}{r} 216 \\ \times 3 \\ \hline 648 \end{array}$ B. $\begin{array}{r} 216 \\ \times 40 \\ \hline 8640 \end{array}$ C. $\begin{array}{r} 216 \\ \times 100 \\ \hline 21{,}600 \end{array}$

1. To check your work interchange the two numbers as shown at the right and multiply.

$$\begin{array}{r} 143 \\ \times 216 \\ \hline \end{array}$$

Find the products. Check your work in 2 and 3.

	a	b	c	d	e
2.	763 582	285 146	194 397	\$2.98 825	\$9.37 641
3.	528 793	798 897	415 852	\$6.41 416	\$6.37 973
4.	7080 195	9600 293	8006 487	\$90.50 675	\$90.07 841
5.	9607 54	8093 80	2764 700	\$58.97 632	\$30.80 459

MORE PRACTICE 350

6. How much do 175 textbooks cost at \$1.48 each?

7. How much do 400 pairs of shoes cost at \$9.50 each?

Zeros in Multiplication with Three-Place Numbers

1. An airplane averages 218 miles an hour. How far does the airplane fly in 304 hours of flying time?

```
   218
 × 304
   872 (4 × 218)
 65400 (300 × 218)
66,272
```

Think of 304 as 300 + 0 tens + 4.
First multiply 218 by 4 ones.
There are no tens to multiply by; so we next multiply 218 by 300, or 3 hundreds. Why are there two 0's in 65400?
How far does the airplane fly in 304 hours?

2. Explain how to find the products below. Then check the answers by interchanging the numbers and multiplying.

```
a.    314              b.     412              c.     546
     ×207                    ×340                    ×250
     2198 (7 × 314)         16480 (40 × 412)        27300 (50 × 546)
    62800 (200 × 314)      123600 (300 × 412)      109200 (200 × 546)
   64,998                 140,080                 136,500
```

In examples b and c there are no ones to multiply by. So we begin by multiplying by the tens.

Copy and multiply. Check your work.

	a	b	c	d	e
3.	359 450	807 910	546 708	\$3.80 290	\$5.80 603
4.	470 209	678 540	609 603	\$8.79 870	\$9.06 109
5.	857 400	396 508	857 960	859 321	964 794
6.	786 487	398 905	987 600	584 708	760 590

MORE PRACTICE 350

Multiplying with an Adding Machine

Tommy's father showed him how to find products on an adding machine.

Example A	Example B
$123 \times \$7.05 = ?$	$321 \times \$7.05 = ?$
.00*	.00*
7.05	7.05
7.05	70.50
7.05	70.50
70.50	705.00
70.50	705.00
705.00	705.00
867.15*	2263.05*

1. Let us see how the product in example A was found.
   a. Why are three 7.05's added in the work under A?
   b. How much is $10 \times \$7.05$? Why are two 70.50's added under A?
   c. What is $100 \times \$7.05$? Why is only one 705.00 added under A? What is the sum under A? Check it.
   d. Now multiply \$7.05 by 123. Is the product correct?
2. Explain the work for example B. Check the answer.

Practice What You Have Learned

	a	b	c	d	e
1.	$28\frac{1}{2} + 16\frac{3}{4}$	$4\frac{3}{4} + 2\frac{2}{3}$	$6\frac{7}{8} - 5\frac{3}{4}$	$5\frac{1}{2} - 2\frac{5}{6}$	$6\frac{3}{4} + 5\frac{5}{6}$
2.	54×20	978×48	736×500	$\$8.37 \times 906$	$\$9.68 \times 372$
3.	23)1384	16)1280	39)3554	58)4692	27)1959

4. \$978.56 + \$64.97 + \$8 + \$4.09 =

5. \$.87 + \$973.65 + \$3.58 + \$49.89 =

Diagnostic Test in Multiplying by Three-Place Numbers

	a	b	c	d	e	
1.	354 100	457 100	920 100	400 100	698 100	(137)
2.	327 300	295 400	896 700	504 900	760 800	(137)
3.	396 473	938 982	745 817	623 956	517 249	(138)
4.	486 504	854 320	804 906	970 650	265 620	(139)

For help, turn to the page given at the right of the row.

★Something to Think About

1. Try to arrange the six examples below in order of the size of their products before you multiply. Write the example with the smallest product first. Then multiply to see if you were right.

a.	b.	c.	d.	e.	f.
85 24	27 24	16 24	400 24	40 24	204 24

2. Arrange the six examples below in the order of the size of the products before you multiply. Then multiply to see if you were right.

a.	b.	c.	d.	e.	f.
87 87	87 20	87 6	87 99	87 10	87 49

3. How can you tell which product will be largest when the same number is multiplied by different numbers?

How Land Is Measured

Large areas of land are measured by the **acre** or by the **square mile.** A square 1 mile long and 1 mile wide is a **square mile.** A square mile, or **section**, contains 640 acres.

1. How many acres are there in a quarter ($\frac{1}{4}$) section?

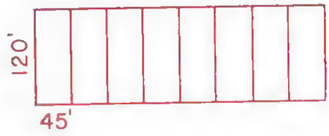
2. In the West, farms often are larger than a square mile. How many acres are there in 4 square miles of land, or 4 sections?

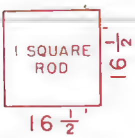
3. The drawing gives the dimensions of a piece of land that has an area of 1 acre. How much is its perimeter?

4. How many square feet is the area of this acre of land?

5. A square whose sides are 209 feet long is almost an acre. How much more than an acre is its area?

6. How much less than an acre are 8 adjoining city lots that are each 45 feet wide and 120 feet deep?



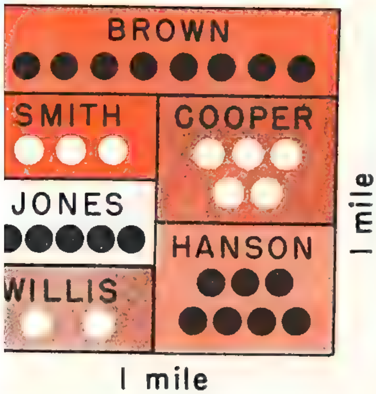


7. Sometimes we measure land by the **square rod.** A rod is equal to $16\frac{1}{2}$ feet. Lay off a square rod in the schoolyard. There are 160 square rods to the acre.

8. The average farm in Germany is about 16 acres. How many such farms are there in 1 square mile?

★ 9. Look up the area of the state in which you live.

★ 10. Find out if the area of your school grounds is greater or less than an acre.



What We Mean by Density of Population

The **dot map** represents one square mile. The dots show the number of people that live on the six farms it contains.

1. How many dots are there on the dot map? What is the population of the square mile?

2. The population of a 4-square-mile area adjoining the square mile shown in the dot map is 140 people. How many people live there on the average to the square mile? How many more is this number than the number of persons shown in the dot map?

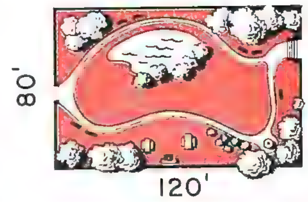
The **density of population** was greater in the 4-square-mile area than in the square mile in the dot map. The average number of people to the square mile was greater there.

3. In the United States the density of population is about 51 to the square mile. How many more is this than the number to the square mile in the dot map?

4. Belgium is the most densely populated country of Europe. The density of population of Belgium is estimated at 722 to the square mile. How many times as great is the density of population of Belgium as of the United States?

★ 5. Look up the density of population of your state.

Practice in Finding Areas



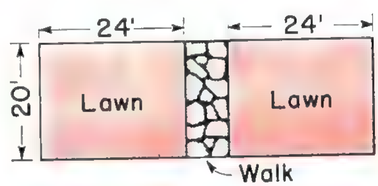
1. What is the area of the park shown in the drawing?

A quick way to find the area of a surface is to multiply its length by its width. Use the same unit of measure in both dimensions. How much is 80 × 120? The product is the number of square feet in the park. What is the area?

2. How many square yards are there in a rug 4 yards by 3 yards?

3. A television set shows a picture with an area of 129 square inches. How much less than 1 square foot is this?

4. The area of Yellowstone Park is about 3458 square miles. How much less is its area than the area of a county 72 miles long and 50 miles wide?



5. How many square feet are there in the lawn shown at the right?

6. Find the areas of the following:

a. A table 36 in. × 40 in.

b. A classroom 36′ × 45′.

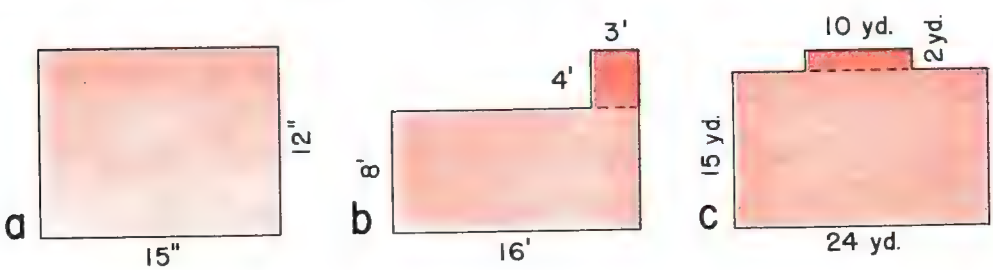
c. A lawn 18 yd. × 16 yd.

d. A farm 160 rods long and 120 rods wide.

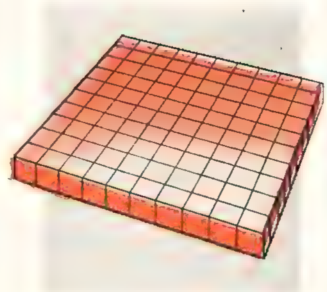
e. A factory site 400′ × 380′.

MORE PRACTICE 351

7. Find the areas represented by the following drawings:



★Just for Fun



Each block in the picture is a **cube** 1 inch long, 1 inch wide, and 1 inch thick.

1. How many blocks are there in the layer of blocks?

2. How many blocks would there be in ten such layers?

3. How many blocks would there be in a layer of 100 rows of inch blocks with 100 blocks in each row? $100 \times 100 = ?$

4. How many blocks would there be in 100 layers of inch blocks if each layer contained 10,000 blocks?

5. Try to show in your room a space large enough to hold 1 million inch blocks.

Practice What You Have Learned

	a	b	c	d	e
1.	$4\frac{1}{2}$ $+3\frac{1}{4}$	248 $\times 100$	$75\overline{)3004}$	9 $-3\frac{1}{2}$	$46\overline{)3956}$
2.	964 $\times 50$	$28\overline{)1722}$	$6\frac{2}{3}$ $+5\frac{5}{6}$	467 $\times 300$	9010 -2704
3.	$16\overline{)9062}$	$8\frac{2}{3}$ $-4\frac{4}{5}$	$\$8.76$ $\times 298$	$37\overline{)2109}$	$7\frac{1}{4}$ $-4\frac{3}{4}$
4.	$6\frac{3}{4}$ $-2\frac{1}{6}$	809 $\times 750$	$59\overline{)51,684}$	$7\frac{3}{4}$ $+6\frac{2}{3}$	$\$7.48$ $\times 406$
5.	$9\frac{3}{5}$ $-3\frac{9}{10}$	$6\frac{5}{6}$ $+8\frac{11}{12}$	$\$35.94$ $\times 928$	$27\overline{)8115}$	$\$998.94$ $+708.06$

How We Measure Things We Buy

1. Which of these foods are usually bought by the dozen?

lettuce eggs apples rolls oranges cookies

2. In many stores, bananas, oranges, apples, and cookies are sold by the pound. Why is selling these things by the pound a better way than selling them by the dozen? Which things pictured above are sold by the pound?

3. Which of these would most likely be sold by the ounce? Why? Name other things sold by the ounce.

spices sugar potatoes pork chops

4. At drug stores, the size of bottles used for medicine is measured in **fluid ounces**. Find the size of a medicine bottle at home.

5. Tom read that a bushel of wheat weighs 60 pounds. In most states grain is sold by weight. Which way would be more accurate to measure a bushel of wheat: to use a bushel basket or to weigh it? Why?

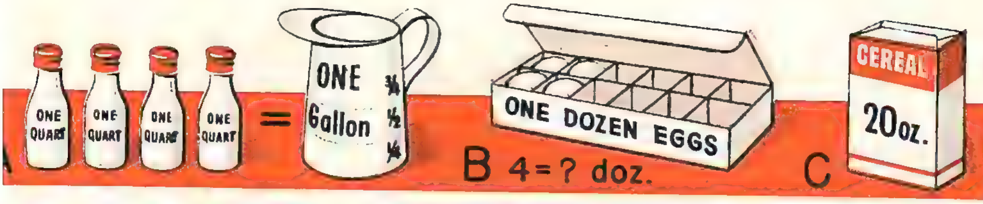
---

6. Dealers usually buy pencils and erasers by the **gross.** A gross is 12 dozen. How many pencils in a gross?

7. Typewriting paper is usually sold by the **ream.** There are 500 sheets in a ream. How many sheets are there in 8 reams?

8. Name two things that are sold by the yard; by the ton; by the barrel.

★ 9. Find out how we tell the sizes of nails; suits; gloves; shoes; stockings; caps; hats; cans of fruit.



Changing Small Measures to Larger Measures

1. What fractional part of a gallon is 2 quarts?

   Think: 1 qt. = $\frac{1}{4}$ gal. So 2 qt. = $\frac{2}{4}$ gal. = ? gal.

2. What fractional part of the carton of eggs is filled?

3. How many pounds does the cereal package weigh?

   Think: 1 lb. = 16 oz. So in 20 oz. there are $16\overline{)20}$, or how many pounds?

   When we change small measures to larger measures, there are fewer large measures. So we **divide.**

$$\begin{array}{r} 1\frac{4}{16} = 1\frac{1}{4} \\ 16\overline{)20} \\ \underline{16} \\ 4 \end{array}$$

4. 8 oz. = ? lb.	7. 5 qt. = ? gal.	10. 72 min. = ? hr.
5. 2 ft. = ? yd.	8. 8 in. = ? ft.	11. 7 pt. = ? qt.
6. 3 qt. = ? gal.	9. 50 in. = ? ft.	12. 18 hr. = ? da.

Changing Large Measures to Smaller Measures

1. How many quarts are there in 3 gallons?

   Think: There will be more quarts than gallons because quarts are smaller than gallons. So we **multiply** 3 by 4.

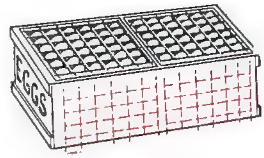
2. How many ounces are there in 2 pounds 4 ounces?

   Think: 2 lb. = 32 oz. So 2 lb. 4 oz. = 36 oz.

3. 2 gal. 3 qt. = ? qt.	8. 5 ft. 4 in. = ? in.
4. 2 qt. $1\frac{1}{2}$ pt. = ? pt.	9. 4 yd. 18 in. = ? in.
5. 3 lb. $4\frac{1}{2}$ oz. = ? oz.	10. 4 ton 500 lb. = ? lb.
6. 3 hr. 10 min. = ? min.	11. 2 da. $12\frac{1}{4}$ hr. = ? hr.
7. 4 min. $20\frac{4}{5}$ sec. = ? sec.	12. 3 bu. 2 pk. = ? pk.

MORE PRACTICE 352

Shipping and Selling Eggs



This is a picture of a case in which eggs are shipped to market by the farmer.

1. How many layers of eggs does the box contain?

2. How many eggs are there in each layer? How can you find the total number in a layer without counting them?

3. How many eggs does the case contain when it is full?

4. How many dozen eggs does the case hold?

5. How much would a farmer receive for 8 cases of eggs at 36 cents a dozen?

6. Eggs are classified according to weight, as shown at the right. Not less than how many pounds does 1 dozen eggs of jumbo size weigh? extra large size? large size? medium size?

SIZE	Not Less Than (per dozen)
Jumbo	30 oz.
Extra Large	27 oz.
Large	24 oz.
Medium	21 oz.
Small	below 21 oz.

7. A baker buys a case of classified eggs that weighs 45 pounds. How much do the eggs weigh on the average a dozen? What size are they?

8. The prices at which eggs were recently sold at a grocery store are given on the poster. How much more do 3 dozen eggs of large size cost than 3 dozen eggs of medium size? How much more than 3 dozen unselected eggs?

PRICES of EGGS (per dozen)	
Large	64¢
Medium	56¢
Unselected	48¢

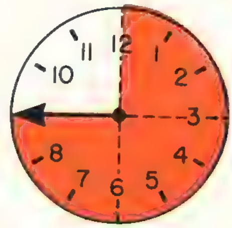
9. Mrs. Jones bought 2 dozen eggs of large size for 84¢ a dozen. How much did she pay for the 2 dozen eggs?

10. How much more do 2 dozen eggs cost at 84¢ a dozen than at 64¢ a dozen?

★ 11. Why are eggs classified according to their sizes?

Using Fractions in Changing Measures

1. An airplane flew from California to New York in 6 hours and 45 minutes. How many hours was this?



45 min. = ? hr.

> Think: 1 hr. = 60 min.
> So 1 min. = $\frac{1}{60}$ hr.
>
> 45 min. = $\frac{45}{60}$ hr., or $\frac{3}{4}$ hr.
> So 6 hr. 45 min. = $6\frac{3}{4}$ hr.

Find the missing numbers:

2. 5 hr. 10 min. = ? hr.
3. 4 min. 30 sec. = ? min.
4. 6 da. 12 hr. = ? da.
5. 4 lb. 12 oz. = ? lb.
6. 5 lb. 4 oz. = ? lb.
7. 3 gal. 3 qt. = ? gal.
8. 4 gal. 2 qt. = ? gal.
9. 2 qt. 1 pt. = ? qt.
10. 4 ft. 8 in. = ? ft.
11. 4 ft. 6 in. = ? ft.
12. 3 yd. 1 ft. = ? yd.
13. 5 yd. 18 in. = ? yd.

MORE PRACTICE 352

★Fun with Magic Squares

1. Prove that A is a magic square. The sums of the four numbers in all rows and lines should be the same.

2. Copy B on your paper. Find the numbers that must be written in the empty spaces to make B a magic square. Which column will tell you what the sums of the others are?

3. Find the missing numbers in C.

A.

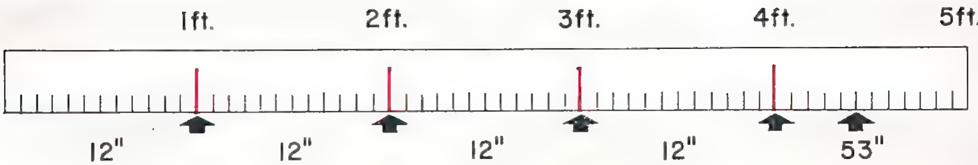
8	$3\frac{2}{3}$	$3\frac{1}{3}$	7
$4\frac{1}{3}$	6	$6\frac{1}{3}$	$5\frac{1}{3}$
$5\frac{2}{3}$	$4\frac{2}{3}$	5	$6\frac{2}{3}$
4	$7\frac{2}{3}$	$7\frac{1}{3}$	3

B.

$\frac{1}{2}$	6	4	?
?	$3\frac{1}{2}$	$5\frac{1}{2}$	1
$7\frac{1}{2}$	?	5	$1\frac{1}{2}$
?	$4\frac{1}{2}$	$2\frac{1}{2}$	8

C.

$2\frac{1}{4}$	?	$\frac{1}{2}$	$1\frac{7}{8}$
?	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{1}{4}$
$1\frac{3}{8}$	?	$1\frac{1}{8}$	$1\frac{3}{4}$
$\frac{3}{4}$	$2\frac{1}{8}$	2	?



Changing Measures—Two Units

1. Mary is 53 inches tall. Express her height as feet and inches. Use the above drawing to find the answer.

$$\begin{array}{r} 4 \\ 12\overline{)53} \\ 48 \\ \hline 5 \end{array}$$

To change 53 in. to feet, divide 53 by 12. There is a remainder of 5 when we divide. You can see that 53 in. = 4 ft. 5 in.

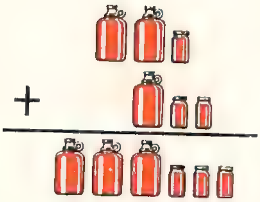
Find the missing numbers, using division as above.

2. 47 in. = ? ft. ? in.
3. 8 ft. = ? yd. ? ft.
4. 40 in. = ? yd. ? in.
5. 58 oz. = ? lb. ? oz.
6. 110 min. = ? hr. ? min.
7. 200 sec. = ? min. ? sec.
8. 27 mo. = ? yr. ? mo.
9. 14 qt. = ? gal. ? qt.
10. 7 pt. = ? qt. ? pt.
11. 14 pk. = ? bu. ? pk.
12. 78 qt. = ? bu. ? qt.
13. 31 da. = ? wk. ? da.
14. Show that 3 feet 18 inches is the same as 4 feet 6 inches.
    Think: 18 in. = 1 ft. 6 in. So 3 ft. 18 in. = 4 ft. 6 in.

15. 3 yd. 4 ft. = 4 yd. ? ft.
16. 4 ft. 20 in. = 5 ft. ? in.
17. 5 lb. 20 oz. = 6 lb. ? oz.
18. 4 hr. 75 min. = 5 hr. ? min.
19. 2 qt. 3 pt. = 3 qt. ? pt.
20. 3 min. 200 sec. = 6 min. ? sec.
21. 5 gal. 9 qt. = 7 gal. ? qt.
22. 3 yr. 19 mo. = 4 yr. ? mo.
23. 6 bu. 9 pk. = 8 bu. ? pk.

MORE PRACTICE 352

Adding Measures

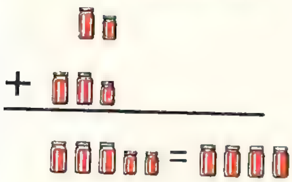


A

1. Use A to find the sum of 2 gallons 1 quart and 1 gallon 2 quarts.

$$\begin{array}{r} 2 \text{ gal. } 1 \text{ qt.} \\ +1 \text{ gal. } 2 \text{ qt.} \\ \hline 3 \text{ gal. } 3 \text{ qt.} \end{array}$$

First add the quarts.
Then add the gallons.
Is 3 qt. less than a gallon?



B

2. Use B to add 1 quart 1 pint and 2 quarts 1 pint. First add the pints. Then add the quarts.

$$\begin{array}{l} \ \ 1 \text{ qt. } 1 \text{ pt.} \\ +2 \text{ qt. } 1 \text{ pt.} \\ \hline \ \ 3 \text{ qt. } 2 \text{ pt., or } 4 \text{ qt.} \end{array}$$

Because 2 pints are 1 quart, change 3 qt. 2 pt. to 4 qt.

3. Add 1 lb. 12 oz. and 1 lb. 8 oz.

$$\begin{array}{r} 1 \text{ lb. } 12 \text{ oz.} \\ +1 \text{ lb. } \ \ 8 \text{ oz.} \\ \hline 2 \text{ lb. } 20 \text{ oz., or} \\ 3 \text{ lb. } \ \ 4 \text{ oz.} \end{array}$$

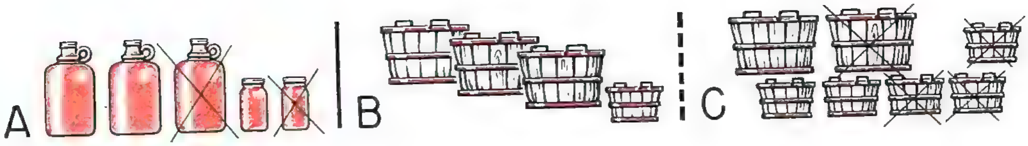
First add the ounces, then the pounds. Because 20 ounces are more than 1 pound, change 20 oz. to 1 lb. 4 oz.

You can see that 2 lb. 20 oz. is the same as 2 lb. + 1 lb. 4 oz., or 3 lb. 4 oz.

Add these measures. Express the answers in simplest form:

	a	b	c	d
4.	3 ft. 5 in. 5 ft. 6 in.	3 yd. 1 ft. 2 yd. 1 ft.	3 lb. 8 oz. 5 lb. 5 oz.	3 hr. 15 min. 4 hr. 20 min.
5.	3 bu. 1 pk. 2 bu. 2 pk.	3 gal. 2 qt. 1 gal. 1 qt.	6 qt. 1 pt. 3 qt. $\frac{1}{2}$ pt.	12 da. 8 hr. 6 da. 10 hr.
6.	2 ft. 8 in. 5 ft. 10 in.	6 yd. 2 ft. 3 yd. 2 ft.	4 lb. 10 oz. 3 lb. 8 oz.	5 hr. 45 min. 8 hr. 30 min.
7.	3 bu. 3 pk. 2 bu. 1 pk.	8 gal. 1 qt. 7 gal. 3 qt.	5 qt. $1\frac{1}{2}$ pt. 7 qt. $1\frac{1}{2}$ pt.	8 da. 12 hr. 7 da. 15 hr.

MORE PRACTICE 353



Subtracting Measures

1. You have 3 gallons 2 quarts of cider and use 1 gallon 1 quart. How much cider remains?

3 gal. 2 qt.	Use A above to find the answer.
−1 gal. 1 qt.	First subtract the quarts.
2 gal. 1 qt.	Then subtract the gallons.

Subtract these measures:

	a	b	c	d
2.	8 ft. 11 in. 2 ft. 3 in.	3 hr. 25 min. 1 hr. 15 min.	3 gal. 3 qt. 1 gal. $1\frac{1}{2}$ qt.	6 lb. 12 oz. 4 lb. 3 oz.
3.	4 min. 40 sec. 3 min. 15 sec.	4 yr. 8 mo. 2 yr. 4 mo.	8 yd. 3 ft. 4 yd. 2 ft.	9 lb. 8 oz. 9 lb. 2 oz.

4. Use B and C to explain the work below.

3 bu. 1 pk.	=	**2 bu. 5 pk.**	
−1 bu. 3 pk.	=	**1 bu. 3 pk.**	
		1 bu. 2 pk.	

We cannot subtract 3 pk. from 1 pk. We take 1 bu. from 3 bu. and change it to 4 pecks. This makes 5 pecks. Then subtract.

MORE PRACTICE

For each example below give the number that is missing:

5. 3 lb. 4 oz. = 2 lb. ? oz.

6. 5 ft. 8 in. = 4 ft. ? in.

7. 4 hr. 15 min. = 3 hr. ? min.

8. 3 gal. 1 qt. = 2 gal. ? qt.

Subtract the following:

	a	b	c	d
9.	3 lb. 4 oz. 1 lb. 6 oz.	5 ft. 8 in. 2 ft. 10 in.	4 hr. 15 min. 2 hr. 30 min.	3 gal. 1 qt 1 gal. 3 qt.
10.	8 min. 2 sec. 4 min. 8 sec.	7 yr. 3 mo. 4 yr. 6 mo.	8 yd. $1\frac{1}{2}$ ft. 7 yd. 2 ft.	8 yr. 3 mo. 3 yr. 7 mo.

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Getting Ready for the Progress Test

Practice Test in Addition

1. $78.56 + $5.97 + $.68 + $256.87 =
2. $897.46 + $16.50 + $.09 + $7.93 =
3. $6.85 + $.20 + $489.75 + $3.89 =

	a	b	c	d	e
4.	$8\frac{1}{2}$	$6\frac{3}{8}$	$7\frac{2}{3}$	$6\frac{3}{4}$	6 ft. 8 in.
	$7\frac{1}{4}$	$5\frac{3}{4}$	$4\frac{5}{6}$	$7\frac{5}{6}$	7 ft. 7 in.

Practice Test in Subtraction

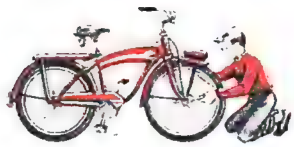
1.	96,943	108,256	87,582	$106.00	$407.30
	38,656	40,509	77,782	29.41	339.83
2.	$3\frac{7}{8}$	$5\frac{1}{2}$	6	$1\frac{1}{4}$	$8\frac{1}{3}$
	$2\frac{1}{8}$	$3\frac{1}{2}$	$2\frac{3}{10}$	$\frac{3}{4}$	$4\frac{2}{3}$
3.	$7\frac{1}{2}$	$6\frac{7}{8}$	$4\frac{1}{4}$	$5\frac{5}{6}$	4 gal. 2 qt.
	$2\frac{1}{4}$	$5\frac{1}{2}$	$2\frac{1}{3}$	$2\frac{3}{8}$	1 gal. 3 qt.

Practice Test in Multiplication

1.	758	857	593	296	750
	20	19	48	73	600
2.	578	849	694	947	687
	137	56	902	896	840

Practice Test in Division

1.	7)63,595	5)40,030	8)60,013	9)70,209	6)87,516
2.	16)816	18)1472	28)2128	45)15,750	40)2100
3.	87)7093	48)1248	98)7863	59)49,871	37)3145



Checking on Important Points

1. Tell a quick way to multiply 48 by 10; by 100.

2. Why can unlike fractions not be added?

3. Which fraction has the largest value: $\frac{3}{8}$, $\frac{3}{4}$, or $\frac{3}{5}$?

4. Show by estimation that the quotient at the right is sensible.

$$\begin{array}{r} \$\ 8.74 \\ 9\overline{)\$78.66} \end{array}$$

5. How do you check a division example in which there is a remainder?

6. Explain each step in working the example at the right. Tell how to check the answer.

$$\begin{array}{r} 4\frac{1}{2} \\ \underline{-2\frac{3}{4}} \end{array}$$

7. Is the area of this page nearest to a square inch, a square foot, or a square yard? Prove your answer.

8. Make a drawing which proves that there are 9 square feet in a square yard.

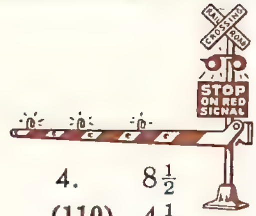
9. What is the difference between finding the area and finding the perimeter of a garden?

Using the Vocabulary of Arithmetic

Explain the meaning of each expression below:

acre	distance	section
approximate	drawn to scale	square
area	estimate	square inch
circle graph	graph	standard time
comparing	perimeter	terms
cube	rectangle	three-place number
denominator	round numbers	to the nearest inch
dimensions	scale drawing	weight

Progress Test IV



1. $4\frac{1}{2}$
(91) $+2\frac{1}{2}$

2. $6\frac{1}{4}$
(100) $+2\frac{7}{8}$

3. $4\frac{5}{6}$
(105) $+3\frac{3}{4}$

4. $8\frac{1}{2}$
(110) $-4\frac{1}{4}$

5. $6\frac{1}{4}$
(111) $-2\frac{3}{8}$

6. $7\frac{1}{5}$
(113) $-2\frac{1}{2}$

7. 3 ft. 6 in.
(131) +4 ft. 10 in.

8. 56
(19) $\times 20$

9. 746
(19) $\times 58$

10. \$2.40
(19) $\times 27$

11. 398
(137) $\times 100$

12. 3 gal. 1 qt.
(152) −1 gal. 3 qt.

13. 497
(138) $\times 429$

14. \$5.86
(139) $\times 360$

15. \$5.08
(139) $\times 509$

16. $56\overline{)1206}$
(31)

17. $16\overline{)902}$
(66)

18. $28\overline{)2342}$
(60)

19. $98\overline{)6566}$
(52)

20. $\frac{1}{2}$ of 17 =
(28)

For help, turn to the page given below the number of the example.

★For Those with No Work to Correct

1. How can you tell that the sum of $\frac{1}{2} + \frac{1}{4}$ is less than 1?

   Think: $\frac{1}{4}$ is less than $\frac{1}{2}$. Since $\frac{1}{2} + \frac{1}{2} = 1$, the sum of $\frac{1}{2} + \frac{1}{4}$ must be less than 1. Find $\frac{1}{2} + \frac{1}{4}$.

2. How can you tell that $\frac{3}{4} + \frac{3}{8}$ is greater than 1?

   Think: $\frac{3}{8}$ is greater than $\frac{1}{4}$. Since $\frac{3}{4} + \frac{1}{4} = 1$, then the sum of $\frac{3}{4} + \frac{3}{8}$ must be greater than 1.

Tell in which of the examples below the sum is less than 1; greater than 1. Check by adding.

3. $\frac{3}{4} + \frac{1}{8} =$

4. $\frac{7}{8} + \frac{1}{4} =$

5. $\frac{1}{2} + \frac{3}{8} =$

6. $\frac{2}{3} + \frac{1}{6} =$

7. $\frac{5}{6} + \frac{1}{3} =$

8. $\frac{3}{4} + \frac{1}{2} =$

9. $\frac{5}{8} + \frac{1}{2} =$

10. $\frac{1}{3} + \frac{1}{2} =$

11. $\frac{1}{2} + \frac{5}{6} =$

Test in Problem Solving IV

1. At 3 for 10 cents how much do 12 doughnuts cost?

2. Ann rides to school in $6\frac{1}{2}$ minutes and Tom in $4\frac{1}{2}$ minutes. How much longer does it take Ann than Tom?

3. How much do 300 books cost at $2.40 each?

4. What is the perimeter of a square flower bed that is $7\frac{1}{2}$ feet on a side?

5. Sausage costs 40 cents a pound. How many pounds can you buy for 70 cents?

6. What is the area of a room that is 14 feet long and 12 feet wide?

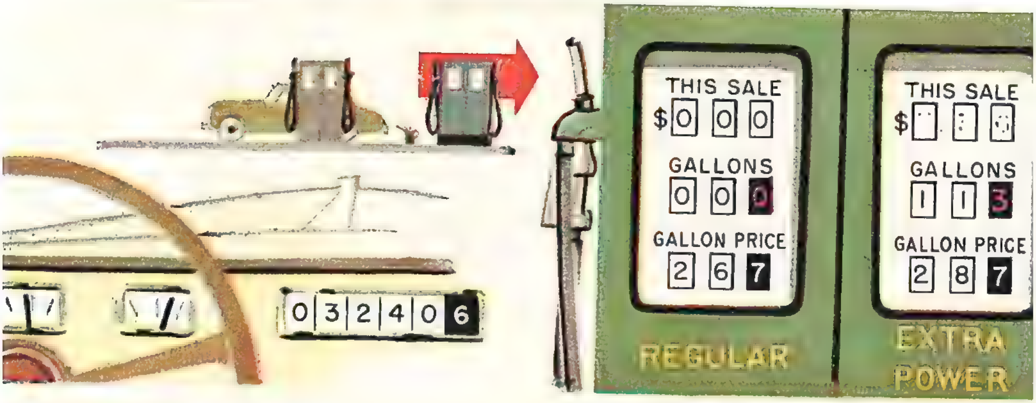
7. What part of a pound is 4 ounces?

8. A grocer paid $2.25 for 15 cans of soup. He sold the soup at 18 cents a can. How much more did he receive for a can than he paid for it?

9. Mary needs 5 yards of cloth for aprons. She has one piece $1\frac{1}{2}$ yards long, and another $2\frac{3}{4}$ yards long. How much more of the cloth does she need?

10. The regular price of handkerchiefs is 30 cents. How much is saved by buying 6 of them at a $\frac{1}{4}$-off sale?

How many problems did you work correctly? Did you beat your score on page 122?



CHAPTER V

Tenths on an Automobile Trip

The picture above shows some of the ways Carlota and Dick found tenths used on an automobile trip.

1. According to the picture, what was the price of a gallon of extra-power gasoline? How much more was this than the price of regular gasoline a gallon?

2. The picture shows the number of gallons their father bought to fill the tank of the car. The tank holds 18 gallons. How many gallons were there in the tank before he bought the new supply?

3. One morning he bought $10\frac{7}{10}$ gallons of gasoline and at noon $9\frac{3}{10}$ gallons. What was the total?

4. The tax on gasoline was $6\frac{5}{10}$ cents a gallon. What was the price of a gallon of extra-power gasoline, not including the tax?

5. They used 10 gallons in going 187 miles. How many miles did they average to a gallon?

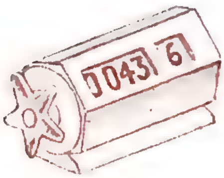
6. The speedometer reading shown above was the reading at the start of the trip. Show that it was $3240\frac{6}{10}$ miles.

7. At the end of the first day the reading was 

How far did they travel that day?

★8. Make a speedometer drawing showing $2302\frac{1}{10}$ miles.

How to Read Decimal Fractions



The cyclometer shows how far Tommy rode his new bicycle the first week he had it. The number is read: 43 and 6 tenths. We can write the number with a **common fraction** as $43\frac{6}{10}$. We can also write the number with a **decimal fraction** as 43.6.

The period in 43.6 is called a **decimal point.** The decimal point separates the whole number, 43, from the decimal fraction, .6. We read $43\frac{6}{10}$ and 43.6 in the same way: 43 **and** 6 tenths. The "and" tells where the decimal point is written.

1. Read these decimal fractions:

.1	.4	.7	.8 in.	.5 yd.	.6 lb.

2. Write the above decimal fractions as common fractions.

The number 43.6 is called a **mixed decimal.** It is made up of a whole number and a decimal fraction.

3. Read the mixed decimals below:

3.7	4.5	6.7	9.4 ft.	28.3 hr.	165.7 bu.

4. Write the above mixed decimals as mixed numbers.

5. Express the following in decimal form:

$\frac{3}{10}$	$\frac{9}{10}$	$\frac{7}{10}$	$4\frac{2}{10}$	$6\frac{5}{10}$	$80\frac{4}{10}$

6. Read the sentences below:
   a. The 100-yard dash was run in 9.6 seconds.
   b. Jack is 56.5 inches tall.
   c. Today the temperature reached 100.4 degrees.

How Tommy's New Cyclometer Works

Tommy bought a cyclometer for his bicycle. The pictures show you how it works.

1. Find the picture of the new cyclometer. How can you tell it has not been used? Which 0 in it is in tenths' place? in ones' place? in tens' place? in hundreds' place?

2. Find the picture that shows Tommy has ridden his bicycle only .1 mile. What number shows in the place for tenths of a mile?

3. Each time Tommy rides .1 mile farther, the figure in tenths' place becomes 1 tenth larger. Show how the cyclometer readings change until you reach the .9 mile picture.

4. When Tommy has ridden 10 tenths of a mile, something new happens on the cyclometer. You know that $\frac{10}{10} = 1$. So on the next cyclometer, you see a 0 in tenths' place. The 1 in ones' place shows 1 whole mile. Find the cyclometer which shows 1 in ones' place and 0 in tenths' place, to the right of ones' place.

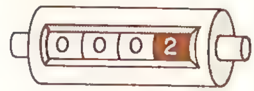
5. How will the cyclometer change after Tommy rides .1 mile farther? .2 mile farther?

6. How much farther must Tommy ride before the number in ones' place changes to 2?

★ 7. Make a drawing showing what the cyclometer reading will then be.

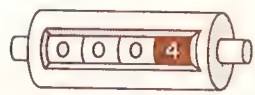
Haven't started yet

One-tenth mile

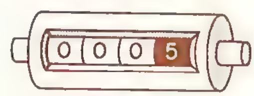


Two-tenths mile

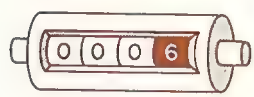
? tenths mile



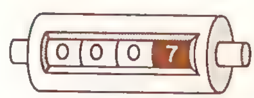
? tenths mile



? tenths mile

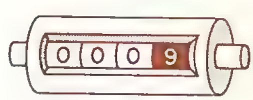


? tenths mile



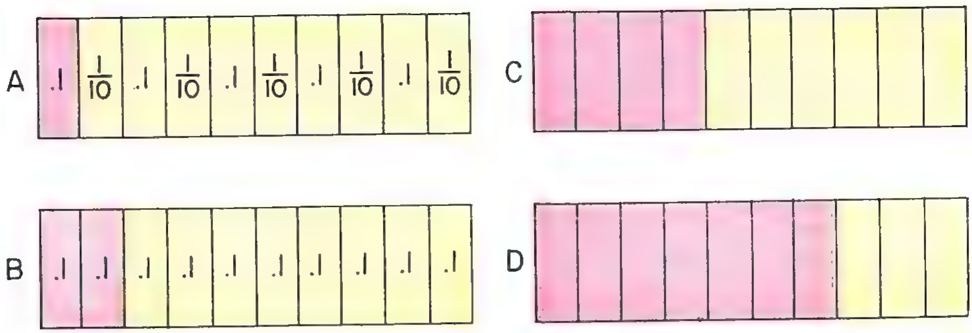
? tenths mile

? tenths mile



? tenths mile

$\frac{10}{10}$ mile = 1 mile



Picturing the Meaning of Tenths

1. What part of A is red? Express the answer as a common fraction and as a decimal fraction.

2. What part of A is yellow?

3. Use A to show that .1 + .9 is 10 tenths, or 1.0. The 1.0 means 1 whole and no tenths.

4. How many tenths of B are red? Prove that $\frac{1}{5}$ of the square is red. This shows that $.2 = \frac{2}{10} = \frac{1}{5}$.

5. How many tenths of C are red? Express the answer as a decimal fraction and also as a common fraction reduced to lowest terms.

6. What part of D is red? Express the answer as a decimal fraction and as a common fraction.

7. Make drawings like those above picturing the meaning of the following decimal fractions: .3; .6; .9; .4.

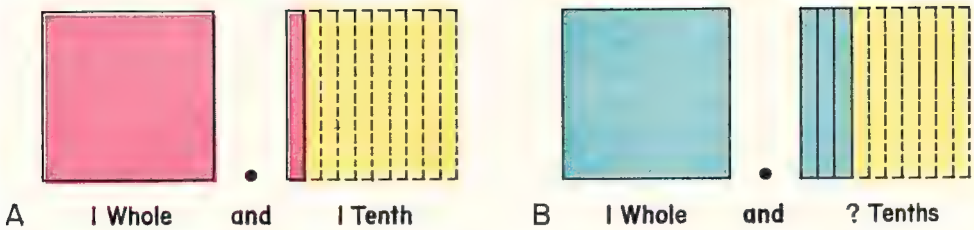
8. How many tenths are red in A and B? .1 + .2 = ?

9. How many tenths are red in B and C? .2 + .4 = ?

10. How many tenths more are red in D than are red in C? .7 − .4 = ?

11. How many tenths are red in all in A, B, C, and D? How much more than 1 whole strip is this? Write the total as a mixed decimal.

☆12. Make a drawing showing that .7 + .8 = 1.5.



Picturing Place Values of Ones and Tenths

1. The two squares in A are of the same size. Into how many strips is the square at the right in A divided? How many tenths are there in 1 whole square? 1 = ten tenths, or $\frac{10}{10}$.

2. How many tenths of the square at the right in A are red? We can say that in A 1 whole square and 1 tenth of a square or 1.1 squares are red.

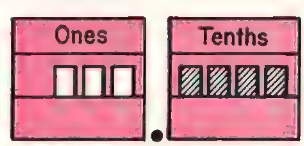
3. Use the drawing to prove that 1 is ten times as much as .1.

4. Prove that B pictures the number 1.3.

5. Make drawings picturing the meaning of these numbers:

a. 1.5 b. 1.2 c. .6 d. .1

Picturing Decimals with Place-Value Charts



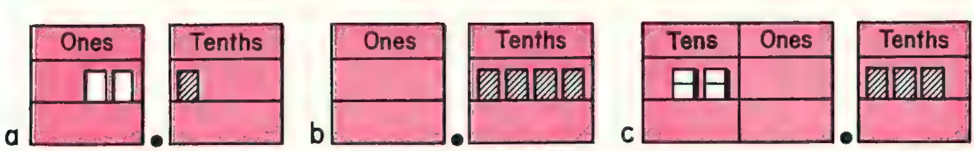
1. What two place-pockets are at the right? A decimal point separates the two pockets. Find it.

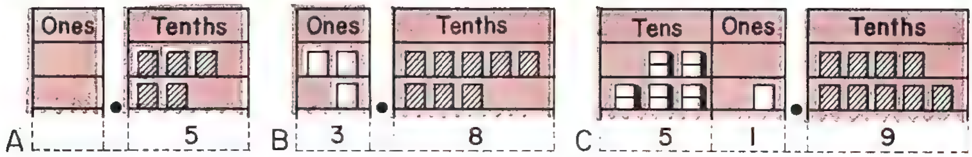
2. How many cards are in ones' pocket?

3. Each gray card in tenths' pocket represents 1 tenth, or .1. How many tenths' cards have the value of 1 card in ones' pocket?

4. Show that the cards in the place-value chart picture 3.4.

5. What number is pictured in each chart below?





Addition of Tenths

Let us use the place-value charts above to find .3 + .2.

1. What two decimal fractions are shown by the two groups of cards in A? How many cards are there in the tenths' pocket?

$$\begin{array}{r} .3 \\ +.2 \\ \hline .5 \end{array}$$

Adding .3 and .2 is just like adding two common fractions. Think: 3 tenths + 2 tenths = 5 tenths, or .5, just as $\frac{3}{10} + \frac{2}{10} = \frac{5}{10}$, or .5.

$$\begin{array}{r} \frac{3}{10} \\ + \frac{2}{10} \\ \hline \frac{5}{10} \end{array}$$

2. What two numbers are shown by the rows of cards in B? How many cards are there in tenths' pocket? How many in ones' pocket?

$$\begin{array}{r} 2.5 \\ +1.3 \\ \hline 3.8 \end{array}$$

3. Use the drawing to tell how to find 2.5 + 1.3. First add the tenths. Then add the ones. In the answer the decimal point separates the ones from the tenths.

$$\begin{array}{r} 2\frac{5}{10} \\ + 1\frac{3}{10} \\ \hline 3\frac{8}{10} \end{array}$$

How much are $2\frac{5}{10} + 1\frac{3}{10}$?

4. What two numbers are pictured in C? Write the example and find the sum of the two numbers.

MORE PRACTICE

5. Tell how to find the sums in these examples:

a.	b.	c.	d.	e.
.3	.1	3.4	25.1	46.3
.2	.6	2.3	14.3	15.4
.5	.7	5.7	39.4	61.7

6. Copy and add. Check by using common fractions.

a	b	c	d	e	f	g
.2	.6	.7	2.4	7.2	8.3	20.4
.5	.3	.1	3.3	4.6	9.0	30.5

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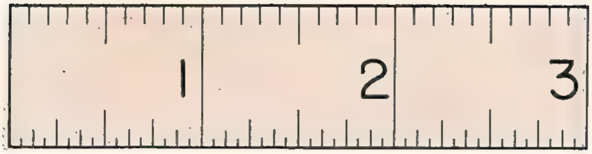


Using a Ruler to Add Decimal Fractions

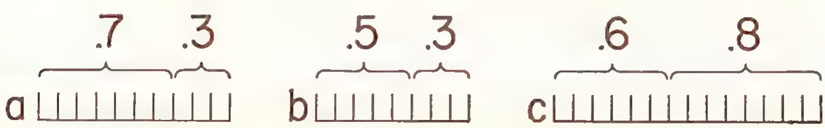
The ruler shown above is used by engineers.

1. Into how many parts is each inch on the upper part of the ruler divided? What part of an inch is each division?

2. Point to the .4-inch mark; to the 1.1-inch mark.

3. How many tenths of an inch are there in 1.1 inches? in 1.4 inches? in 2.0 inches? in 2.4 inches?

4. Each line below has two parts divided into tenths of an inch. Which line is .8 inch long? 1.0 inch long? 1.4 inches long? How do you know?



5. Use the picture of the ruler to find the following:

a. .4 in. + .5 in. = b. .6 in. + .4 in. = c. .7 in. + .8 in. =

6. Use the ruler to see how many tenths of an inch are the same as $\frac{1}{2}$ inch. $\frac{1}{2} = \frac{?}{10}$

★ 7. Which is more, $\frac{1}{8}$ inch or .1 inch?

Which Is Easier to Add?

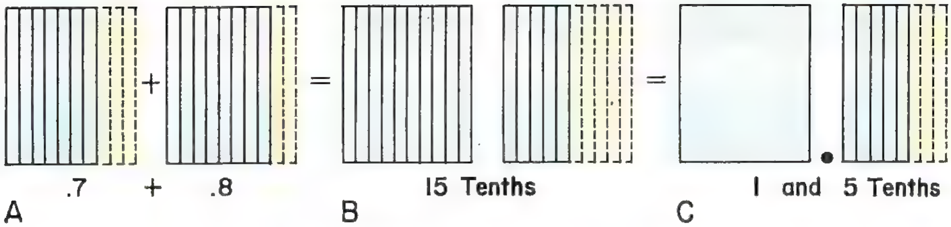
A.
$$\begin{array}{rcr} 4\frac{1}{2} & = & 4\frac{5}{10} \\ +3\frac{4}{10} & = & 3\frac{4}{10} \\ \hline & & 7\frac{9}{10} \end{array}$$

B
$$\begin{array}{r} 4.5 \\ +3.4 \\ \hline 7.9 \end{array}$$

1. Which is easier to add, the mixed numbers in A or the mixed decimals in B? Why?

2. Add in two ways: Three and four tenths + five and three tenths.

3. In most reference books decimal fractions are used instead of common fractions. Why?



Carrying in Adding Tenths

1. How many tenths are blue in each of the two squares in A? in the two squares? The total is shown as tenths in B. How many wholes are there in 15 tenths? How many tenths more than 1 whole are there in 15 tenths? This is shown in C.

2. To add .8 + .7, think: 8 tenths + 7 tenths = 15 tenths. This is 1 whole and 5 tenths. When the sum is in tenths, point off tenths in the answer.

$$\begin{array}{r} .8 \\ +.7 \\ \hline 1.5 \end{array} \qquad \begin{array}{r} \frac{8}{10} \\ +\frac{7}{10} \\ \hline \frac{15}{10} = 1\frac{5}{10} \end{array}$$

3. Sometimes there is carrying in adding mixed decimals.

First add the tenths. .8 + .7 = 15 tenths, or 1.5. Write .5 in the sum. Carry the 1 one to ones' place. Add the ones. 1 + 2 + 3 = 6. The sum is 6.5.

$$\begin{array}{r} 2.8 \\ +3.7 \\ \hline 6.5 \end{array} \qquad \begin{array}{r} 2\frac{8}{10} \\ +3\frac{7}{10} \\ \hline 5\frac{15}{10} = 5 + 1\frac{5}{10} = 6\frac{5}{10} \end{array}$$

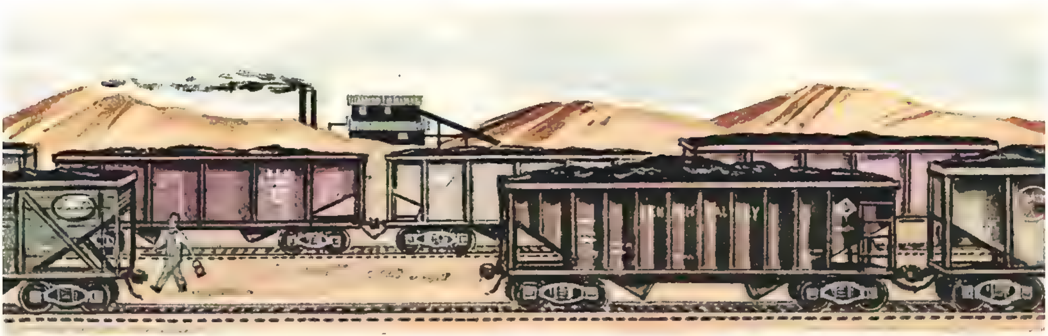
4. Explain how the sums below are found.

a.	b.	c.	d.	e.
.9	.3	4.6	8.7	49.6
.4	.7	3.8	4.3	20.8
1.3	1.0	8.4	13.0	70.4

MORE PRACTICE 354

Copy and find the sums of the following:

	a	b	c	d	e	f
5.	.7	.8	.2	.4	.6	.9
	.5	.9	.8	.5	.8	.1
6.	9.8	8.7	8.3	12.7	29.8	68.2
	6.5	6.4	25.4	8.3	38.4	86.7



★Where Our Coal Is Produced

The table tells how much coal was produced in our greatest coal-producing states in a recent year.

	Million Tons		Million Tons
West Virginia	176.2	Illinois	67.9
Pennsylvania	147.1	Ohio	37.5
Kentucky	84.2	Indiana	25.4

1. Which state produced the most coal? 176.2 millions means 176,200,000 because .2 million = 200,000.

2. How many tons were produced in Illinois? Write the number as shown in problem 1.

3. How many tons were produced in all in West Virginia, Pennsylvania, and Kentucky?

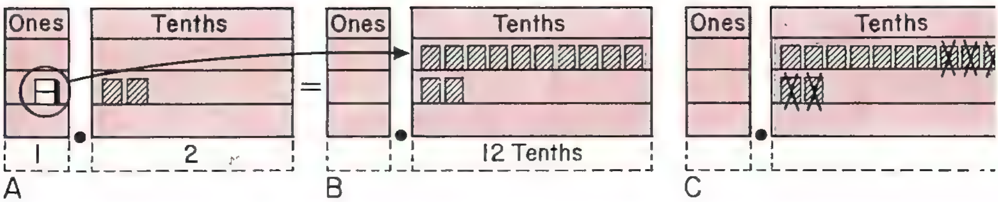
4. How many tons were produced in all in Illinois, Ohio, and Indiana?

5. How many million tons were produced in the six states?

Practice What You Have Learned

	a	b	c	d	e
1.	$\begin{array}{r}\$4.78\\ -2.69\\ \hline\end{array}$	$\begin{array}{r}4\frac{3}{10}\\ -1\frac{7}{10}\\ \hline\end{array}$	$\begin{array}{r}27.8\\ +36.5\\ \hline\end{array}$	$\begin{array}{r}9\frac{3}{10}\\ +6\frac{7}{10}\\ \hline\end{array}$	$\begin{array}{r}4\frac{1}{2}\\ +2\frac{3}{10}\\ \hline\end{array}$
2.	$\begin{array}{r}8\frac{1}{2}\\ -1\frac{1}{5}\\ \hline\end{array}$	$\frac{3}{4} = \frac{?}{100}$	$\frac{1}{8} = \frac{?}{1000}$	$\begin{array}{r}.6\\ +.4\\ \hline\end{array}$	$\begin{array}{r}8\frac{9}{10}\\ -1\frac{9}{10}\\ \hline\end{array}$
3.	$24\overline{)\$9.60}$	$25\overline{)\$7.50}$	$\frac{1}{2}$ of $.16 =	$5 \times \$.75 =$	$\frac{1}{2} = \frac{?}{100}$

4. $3.6 + 4.8 + .6 + 4.0 =$



Subtracting Tenths

1. How much is .7 − .3?

$$\begin{array}{r} .7 \\ -.3 \\ \hline .4 \end{array}$$

Think: 7 tenths − 3 tenths = 4 tenths, or .4, just as $\frac{7}{10} - \frac{3}{10} = \frac{4}{10}$, or .4.
.4 is correct because .4 + .3 = .7.

$$\begin{array}{r} \frac{7}{10} \\ -\frac{3}{10} \\ \hline \frac{4}{10} \end{array}$$

2. Tell how to find the remainders below.

a.	b.	c.	d.	e.
$\begin{array}{r} .6 \\ .4 \\ \hline .2 \end{array}$	$\begin{array}{r} .9 \\ .5 \\ \hline .4 \end{array}$	$\begin{array}{r} 7.3 \\ 2.1 \\ \hline 5.2 \end{array}$	$\begin{array}{r} 8.5 \\ 2.5 \\ \hline 6.0 \end{array}$	$\begin{array}{r} 21.6 \\ 11.5 \\ \hline 10.1 \end{array}$

3. A, B, and C show how to find 1.2 − .5.

$$\begin{array}{r} {\scriptstyle 12} \\ \cancel{1}.\cancel{2} \\ -.5 \\ \hline .7 \end{array}$$

We cannot subtract .5 from .2. We must change the 1 one in 1.2 to 10 tenths, as shown above in A and B. This makes in all 12 tenths. How much is 12 tenths − 5 tenths? See C above.

$$\begin{array}{rcr} 1\frac{2}{10} & = & \frac{12}{10} \\ -\frac{5}{10} & = & \frac{5}{10} \\ \hline & & \frac{7}{10} \end{array}$$

4. How much is 4.2 − 1.5?

MORE PRACTICE 355

$$\begin{array}{r} {\scriptstyle 3\ 12} \\ \cancel{4}.\cancel{2} \\ -1.5 \\ \hline 2.7 \end{array}$$

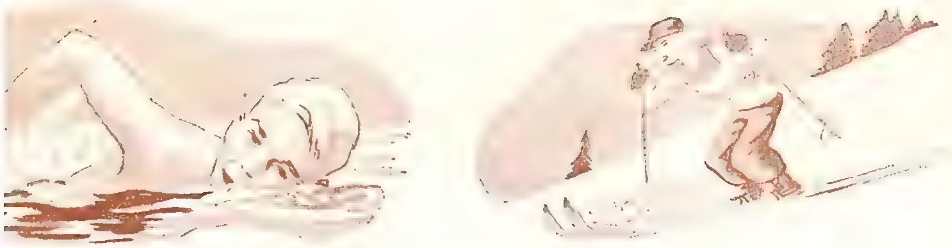
We cannot subtract .5 from .2. So we take 1 one from the 4 ones, leaving 3 ones. We change the 1 one to 10 tenths, making in all 12 tenths. How do we get the 2.7?

$$\begin{array}{rcr} 4\frac{2}{10} & = & 3\frac{12}{10} \\ -1\frac{5}{10} & = & 1\frac{5}{10} \\ \hline & & 2\frac{7}{10} \end{array}$$

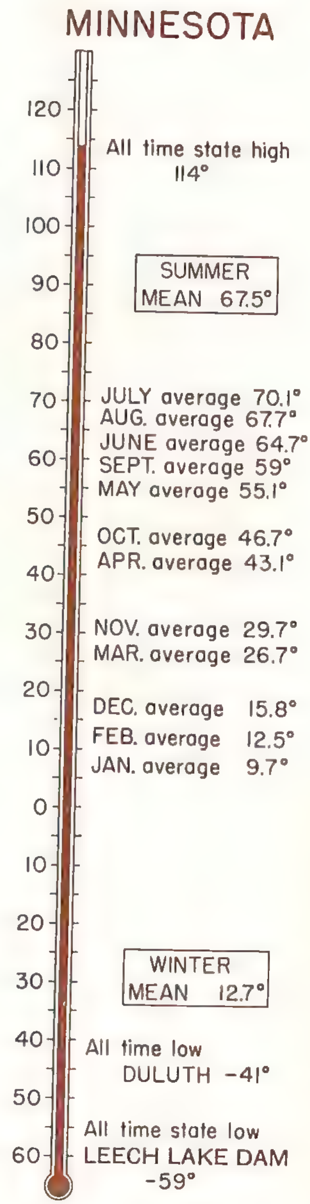
5. Tell how to find the remainders. Check the answers.

a.	b.	c.	d.	e.
$\begin{array}{r} 4.1 \\ 2.6 \\ \hline 1.5 \end{array}$	$\begin{array}{r} 9.3 \\ 5.4 \\ \hline 3.9 \end{array}$	$\begin{array}{r} 23.5 \\ 16.8 \\ \hline 6.7 \end{array}$	$\begin{array}{r} 31.4 \\ 20.6 \\ \hline 10.8 \end{array}$	$\begin{array}{r} 48.5 \\ 41.9 \\ \hline 6.6 \end{array}$

6. 5.4 − 1.2 = 7. 9.6 − 7.8 = 8. 48.5 − 19.4 =



All Kinds of Weather



This newspaper clipping gives information about the temperature of Minnesota.

1. What is the lowest temperature shown on the thermometer? What is the highest temperature?

2. What is the summer **mean** (average)? What is the winter mean? Find the difference between the two means.

3. What was the all-time low in Duluth? How much higher is this than the all-time low for Leech Lake Dam?

4. What was the all-time state high? What was the lowest temperature ever recorded in the state? How many degrees is the difference between these two readings?

5. What is the March average for the state? What is the July average? Find the difference.

6. In what month is the state average lowest? In what month is it highest? Find the difference between these averages.

7. How much higher is the December average than the January average?

★ 8. How much does the temperature vary (change) where you live?

At a Track Meet

1. John won the 60-yard dash. His time was 7.2 seconds. The track record was 6.9 seconds. How much slower than the track record was John's time?

2. The time for the 100-yard dash was 10.1 seconds. The track record was 9.9 seconds. Find the difference between the track record and the time at the meet.

3. Keith read that the world record for the 100-yard dash was 9.4 seconds. For the 220-yard dash it was 20.3 seconds. How much was the difference in the distance of the two races? What was the difference in time?

★4. The world record for the mile run was 3 minutes 58.8 seconds. For the two-mile run it was 8 minutes 40.4 seconds. Find the difference in time.

★5. Look up American records in track events.

Practice What You Have Learned

	a	b	c	d	e	f
1.	.5	.7	3.1	4.8	27.4	20.4
	+.4	−.4	+4.3	−2.5	+17.4	−16.4
2.	.8	.9	6.4	9.7	81.9	35.4
	+.5	+.7	+5.8	+6.8	+16.1	+24.9
3.	1.4	1.8	1.3	26.3	43.5	200.3
	−.8	−.9	−.4	−14.8	−12.6	−156.7
4.	$3\frac{1}{2}$	$4\frac{1}{4}$	$8\frac{4}{5}$	$9\frac{3}{4}$	$8\frac{1}{8}$	$7\frac{1}{3}$
	$-2\frac{1}{2}$	$+2\frac{3}{8}$	$+3\frac{2}{10}$	$-2\frac{1}{2}$	$-2\frac{3}{4}$	$-1\frac{3}{4}$

Saving Money to Buy a Bicycle

1. John has \$28.00. He wants to buy a bicycle, costing \$35.50. How much more must he save?

2. He delivered 18 orders of groceries for Mr. Hove, the grocer. He was paid 15 cents for each order. How much did he earn delivering the groceries? He added all that he earned to the \$28.00. How much did he then have? How much more money must he have before he can buy the bicycle?

3. At the rate of \$.60 a week how long would it take John to earn \$4.80? How much is \$4.80 ÷ \$.60?

A. $\$.60\overline{)\$4.80}$ B. $60\overline{)480}$ Change both \$.60 and \$4.80 to cents. Divide as in B.

4. How long would it take John to save \$4.80 at the rate of \$.80 a week? of \$.40 a week?

In which answers below must you point off dollars and cents?

	a	b	c
5.	29 × \$.85 =	16 × 35¢ =	20 × \$4.80 =
6.	68 × \$1.57 =	9 × 4¢ =	4 × 21¢ =

Find the quotients:

	a	b	c
7.	\$84.50 ÷ 5 =	\$76.20 ÷ 10 =	\$84 ÷ \$14 =
8.	\$9.60 ÷ \$.08 =	\$7.75 ÷ \$.25 =	\$14.40 ÷ \$.12 =

Our Money Is a Decimal System

1. How many cents make a dime? How many dimes make a dollar? How many dollars make ten dollars?

Our money system is a **decimal system** because it is built on tens. "**Decem**" is a Latin word meaning "ten."

2. What does each of the 1's in the number $11.11 mean?

3. What part of a dollar is 1 cent, or $.01? (.01)

Think: There are 100 cents in a dollar. So 1 cent = $\frac{1}{100}$ of a dollar. So $.01 really means 1 hundreth of a dollar.

4. Prove that 1 dime is 1 tenth of a dollar, or 10 hundredths of a dollar. $.10 really means 10 hundredths of a dollar.

In $11.11 the decimal point separates whole dollars from tenths and hundredths of a dollar.

5. Write these amounts with figures, using the $ sign:

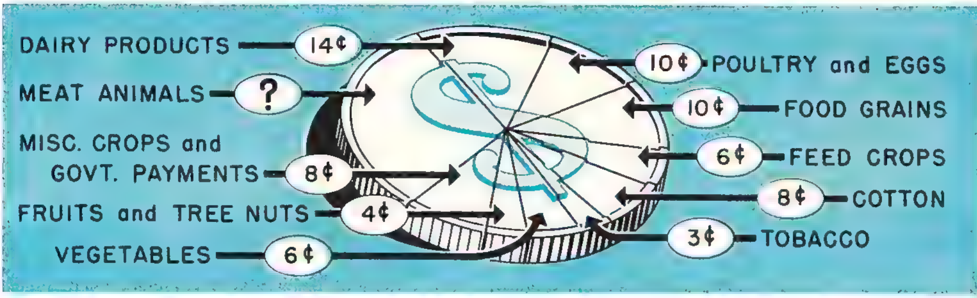
a. One dollar and eleven cents
b. Twelve cents
c. Two dollars and 3 cents
d. Two cents
e. Ten dollars and four cents
f. Three dollars and fifty cents

6. In the number $11.11 how does the value of the 1 change as you go from right to left? How does the value of the 1 change as you go from left to right?

Find the answers to the following examples:

7.	8.	9.	10.	11.
$3.54	$9.02	$.67	$7.00	$36.24
+5.87	−2.58	−.59	−2.46	+24.76

★12. Prove that our system of measuring liquids is not a decimal system.



The Dollar the Farmer Gets

The **circle graph** shows where the average American farmer gets his cash income.

1. How many cents of every dollar come from dairy products? How many from poultry and eggs?

2. How many cents come from food grains and feed crops?

3. How many cents come from all the items except meat on the graph?

4. How many cents come from meat animals? What are meat animals?

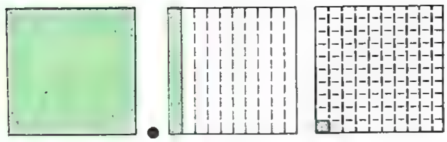
5. How much more than one quarter of every dollar comes from meat animals?

6. How much less than one quarter of every dollar comes from dairy products and from poultry and eggs?

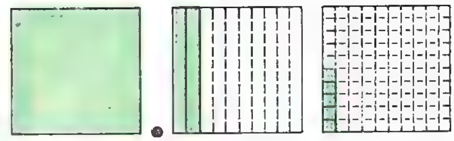
7. How much less than half of every dollar received comes from meat animals and dairy products?

8. How many times as much comes from dairy products as from cotton? from vegetables? from tobacco? from food grains? from meat animals?

★9. What are the chief sources of cash income for farmers in the state in which you live?

A 

1 whole and 1 tenth (.1) and 1 hundredth (.01)

B 

1 whole and 2 tenths and 5 hundredths

Picturing Place Values of Tenths and Hundredths

The drawings in A picture the meaning of the number 1.11.

1. What does the whole square in A represent?

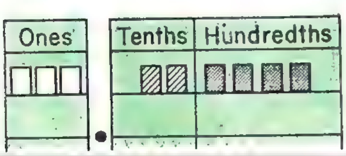
2. In A, into how many strips is the first square to the right of ones' place divided? What part is green?

3. In A, into how many parts is the second square to the right of ones' place divided? What part is green? How many hundredths are there in 1 tenth? in 1 whole?

Notice how much smaller $\frac{1}{100}$ is than $\frac{1}{10}$. We write $\frac{1}{100}$ in decimal form as .01. The 1 is in the second place to the right of ones' place. This is **hundredths'** place.

4. What number is pictured by the drawings in B?

Using Place-Value Charts to Show Hundredths



C

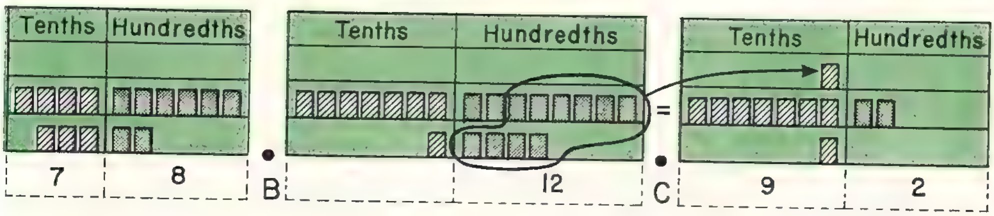
1. What is the number that is shown by this place-value chart? Write it.

2. We exchange 10 black cards in hundredths' pocket for one of the gray tenths' cards. There are 10 hundredths in 1 tenth. How many hundredths' cards have the same value as 1 card in ones' pocket? $1 = \frac{?}{100}$

3. Read these numbers: 4.15 2.03 21.42 53.00

4. Suppose we take out all of the cards in tenths' pocket in C. What is the number then shown in the chart?

5. Place one more card in each pocket in the chart. What number does the chart then show? If we take one card out of each pocket, what number is then shown?



Adding Hundredths

1. There is a rain gauge that measures rainfall in hundredths of an inch. Suppose that in a city .46 inch fell before noon and .32 inch more by midnight. What was the total rainfall on that day?

$$\begin{array}{r} .46 \\ +.32 \\ \hline .78 \end{array}$$

Adding hundredths is like adding cents. First add the hundredths, then the tenths. Because we are adding hundredths, the sum is .78. A shows this.

2. Suppose that in this city .14 inch of rain fell on the next day. How much rain fell in the two days? .78 in. + .14 in. = ?

$$\begin{array}{r} .78 \\ +.14 \\ \hline .92 \end{array}$$

First add the hundredths. We change the 12 hundredths to 1 tenth and 2 hundredths. This is like changing 12 cents to 1 dime and 2 cents. B and C above show this. How do we get the .92?

3. One month there were 2.47 inches of rain and in the next month 3.85 inches of rain. Find the total rainfall.

$$\begin{array}{r} 2.47 \\ +3.85 \\ \hline 6.32 \end{array}$$

Add just as in adding dollars and cents.
Tell how each figure in the sum is found.
How many inches of rain fell in the two months?

4. Tell how we find the sums in the examples below.

a.	b.	c.	d.	e.
.33	.04	.74	2.54	49.38
.54	.05	.98	3.49	54.92
.87	.09	1.72	6.03	104.30

Find the sums below. Check your work.

5. .28 + .41 =   6. 9.78 + 3.59 =   7. 37.19 + 62.81 =

MORE PRACTICE 354

Subtracting Hundredths

1. The list at the right gives the average yearly rainfall in five cities in the United States and Alaska. Which city has the highest yearly rainfall?

Average Yearly Rainfall	
Phoenix	7.81 in.
Spokane	15.78 in.
Cleveland	33.36 in.
New Orleans	60.01 in.
Juneau	84.42 in.

2. How much more is the average yearly rainfall in Spokane than in Phoenix?

$$\begin{array}{r} 15.78 \\ -7.81 \\ \hline 7.97 \end{array}$$

Subtract hundredths just as you subtract dollars and cents. Show that the work in the example is correct. Check by adding 7.81 and 7.97.

3. How much less is the average yearly rainfall in Spokane than in Cleveland?

$$\begin{array}{r} 33.36 \\ -15.78 \\ \hline 17.58 \end{array}$$

Show how we get each figure in 17.58.

Be sure to place the decimal point in the answer.

How can you tell the decimal point should be placed before the 5?

4. Find the difference in average yearly rainfall in New Orleans and Juneau.

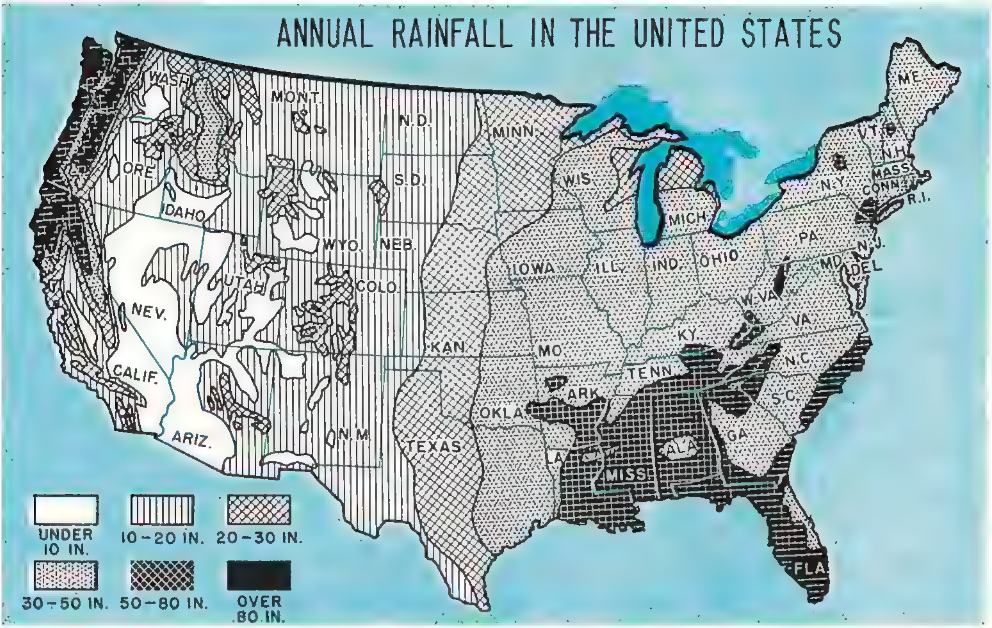
5. How much more rainfall has Juneau than Spokane? than Phoenix? than Cleveland?

MORE PRACTICE 355

★ 6. What is the average yearly rainfall where you live?

Subtract. Check your answers.

	a	b	c	d	e	f
7.	$\begin{array}{r} .96 \\ \underline{.24} \end{array}$	$\begin{array}{r} .86 \\ \underline{.26} \end{array}$	$\begin{array}{r} .90 \\ \underline{.45} \end{array}$	$\begin{array}{r} .86 \\ \underline{.06} \end{array}$	$\begin{array}{r} .58 \\ \underline{.52} \end{array}$	$\begin{array}{r} .79 \\ \underline{.68} \end{array}$
8.	$\begin{array}{r} 8.67 \\ \underline{1.42} \end{array}$	$\begin{array}{r} 9.71 \\ \underline{4.37} \end{array}$	$\begin{array}{r} 6.80 \\ \underline{2.34} \end{array}$	$\begin{array}{r} 5.97 \\ \underline{1.07} \end{array}$	$\begin{array}{r} 3.59 \\ \underline{2.53} \end{array}$	$\begin{array}{r} 5.70 \\ \underline{1.67} \end{array}$



The United States Has Water Worries

1. This map shows the average **annual** (yearly) rainfall in different parts of the United States. How do the rectangles below the map help you to tell the amounts?

2. What is the annual rainfall in western Oregon? in southeastern California?

3. Is the rainfall heavier in western Washington or in eastern Washington? In what part of Washington is the yearly rainfall under 10 inches? Why the difference?

4. Which state as a whole seems to have the least rainfall?

5. Show that the rainfall is heavier in the southeast than in the middle west.

6. One year the total rainfall of a city in eastern Iowa was 28 inches. Show that this was below the average.

★7. How do we protect against drought and floods? Where are there big irrigation projects?

A Spending Pattern for a Family of Four

The budget given below is for one year for an average American family of four persons. Make a neat copy of the budget. Show the headings given below. Find the numbers that should be in the places that are numbered. Begin with (1), then (2), and so on.

	Amount Spent in a		
	Year	Month	Day
Income and other taxes	$ 84.00	(2)	(12)
Food	1080.00	(3)	(13)
Rent, heat, utilities, and house operation	690.00	(4)	(14)
Clothing	300.00	(5)	(15)
House furnishings	96.00	(6)	(16)
Automobile or other transportation	150.00	(7)	(17)
Medical expenses	150.00	(8)	(18)
Personal allowances, recreation, and gifts	300.00	(9)	(19)
Insurance and savings	150.00	(10)	(20)
Totals	(1)	(11)	(21)

a. In finding items (12) to (20) count 30 days as a month.

b. Find the total for a day also by dividing the total for a month (11) by 30. If (21) and the total you find are the same, your work checks.

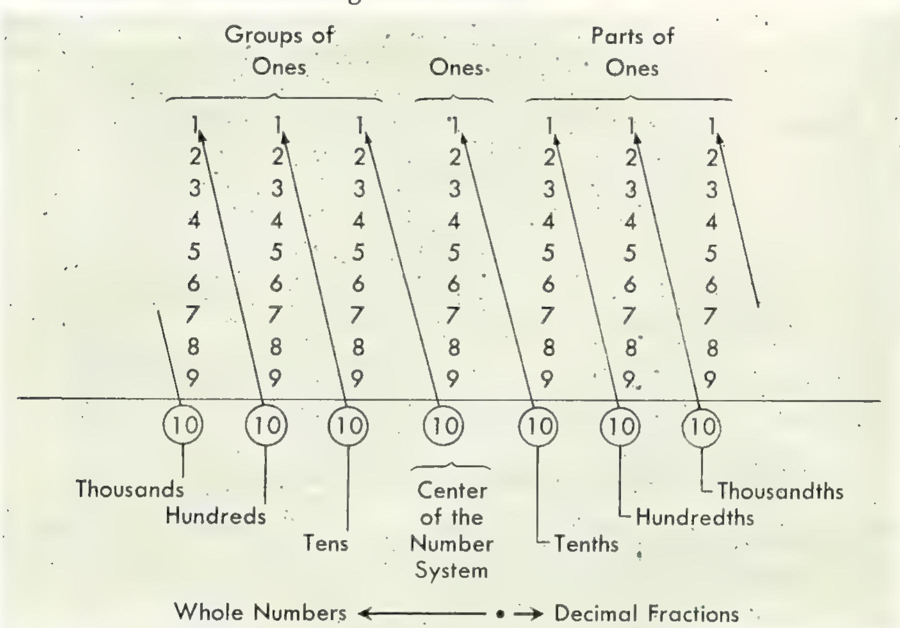
c. A man works five days a week and 8 hours a day for $1.50 an hour. How much does he earn in four weeks?

The Meaning of Thousandths

Keith read that a jet plane had flown at the rate of 10.278 miles a minute. Can you read this number?

The .278 is a three-place decimal. The .2 alone means 2 tenths; the .27 means 27 hundredths. The 8 is written in thousandths' place. This is the third place to the right of ones' place. .278 is read: 278 **thousandths.** The number 10.278 is read: 10 and 278 thousandths.

In reading a decimal fraction we give it the name of the last place in the number. The chart will help you to understand the meaning of decimals.



1. How many places to the left of ones' place is tens' place? How many places to the right of ones' place is tenths' place?

2. In 1.469 the decimal point locates ones' place for us. Read the number.

3. Tell the name of the place in which each figure is written in these numbers. Then read the numbers.

a. 4.349 b. 269.438 c. .107 d. 248.5 e. 24.59

Some Everyday Uses of Decimal Fractions

Here are some sentences containing decimals. The children in a class found them in books, newspapers, and magazines. Be ready to read the sentences aloud.

1. The rainfall yesterday amounted to 1.35 inches.
2. The time of the winner was 9.8 seconds.
3. A jet plane averaged 12.675 miles a minute.
4. The price of gasoline is 28.7 cents a gallon.
5. The type in a book is .152 inch high.
6. A sheet of gold leaf is .001 inch thick.
7. The normal temperature of the human body is 98.6°.
8. The number of a library book was 983.47.
9. A sugar-cane field yields about 17.5 tons of sugar.
10. The world record for automobiles is 394.196 miles an hour.
11. 26.5 cents is the same as $.265.
12. A knot, a unit used to measure the speed of ships, is equal to 1.151 miles an hour.
13. Our railroads employ about 1.5 million people.

★14. Try to find one other illustration of the use of decimals in life outside the school.

Practice What You Have Learned

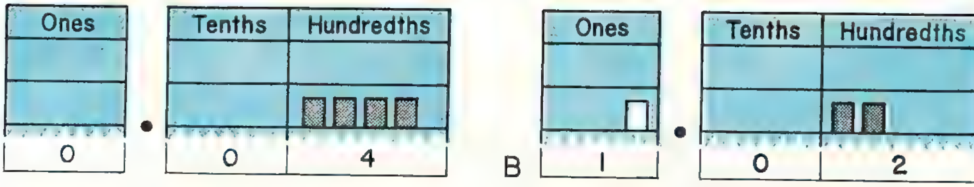
1. Write the following as mixed numbers:

3.7 4.31 87.3 9.307 20.09 3.001

2. Write the following in decimal form:

$4\frac{9}{10}$ $\frac{17}{100}$ $\frac{189}{1000}$ $1\frac{34}{100}$ $5\frac{283}{1000}$ $8\frac{27}{100}$

3. Write the largest possible 2-place decimal; 3-place decimal.



Zero a Place Holder in Decimal Fractions

1. How many ones do you see in A? How many tenths? How many hundredths?

To write 4 hundredths, we must write 0 in tenths' place. Then the 4 will be in hundredths' place.

2. Read these decimal fractions: .01; .08; .25.

3. Write as decimal fractions: $\frac{3}{100}$; $\frac{7}{100}$; $\frac{9}{100}$; $\frac{27}{100}$.

4. What number is pictured in B? Write the number.

5. Write as a decimal: 3 thousandths. Why must you write zeros in tenths' and hundredths' places in the number?

6. Read these decimal fractions: .007; .008; .005.

7. Read the number .059. In what place is the 0 written?

The name of a decimal fraction is always the name of the last place in the number.

Tenths	Hundredths	Thousandths
.0	5	9

8. Write as decimal fractions:

$\frac{4}{1000}$; $\frac{27}{1000}$; $\frac{3}{10}$; $\frac{6}{100}$; $\frac{19}{1000}$; $\frac{15}{100}$.

Read the numbers below:

	a	b	c	d	e
9.	27.4	20.2	.36	4.02	363.8
10.	8.379	.125	4.020	.08	2.001

11. Write the following in decimal form:

a. Three and three hundredths　　b. Twelve thousandths

12. How do you know that .007 is 7 thousandths?

13. Write twenty and four thousandths in decimal form.

14. Which is most: .007, .014, or .046?

Adding and Subtracting Thousandths

1. A machinist has two flat steel bars. One is .375 inch thick, the other .250 inch thick. How thick would the two bars be if laid one on the other?

.375
+.250
.625

We add thousandths just as we add tenths and hundredths. Add the thousandths first, then the hundredths, then the tenths. Tell how we get the sum .625.

2. Find the difference in the thickness of the bars.

.375
−.250
.125

We subtract thousandths just as we subtract tenths and hundredths. Subtract the thousandths first, then the hundredths, then the tenths. Tell how we get the remainder .125.

3. Show that the remainders below are correct.

a.	b.	c.	d.	e.
.482	.325	.325	325	85.368
.246	.278	.321	321	24.597
.236	.047	.004	4	60.771

Why do we write the zeros in b and c, but not in d?

MORE PRACTICE

Find the sums. Check your work.

	a	b	c	d	e
4.	.492	.052	.004	.956	.458
	.261	.068	.002	.844	.542
5.	6.375	9.874	7.003	9.070	38.856
	2.489	3.628	4.006	8.906	61.144

354

Subtract. Check your work.

355

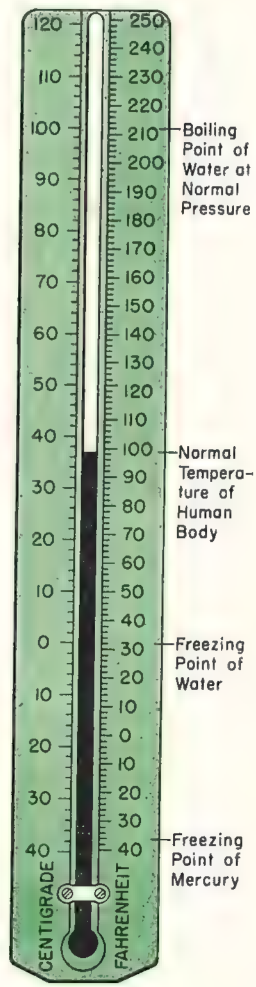
6.	.587	.847	.006	4.962	47.020
	.129	.238	.002	1.892	16.843

Two Kinds of Thermometers

John asked his teacher, "Miss Smith, what is the difference between a **centigrade** and a **Fahrenheit** thermometer?"

The information at the right shows the difference. Use the picture of the thermometer to check the figures.

	Centigrade	Fahrenheit
Water boils	100°	212°
Blood heat	36.7°	98.6°
Water freezes	0°	32°
Colder	—17.8°	0°
Very cold	—40°	—40°



1. Tell at what temperature water boils according to the centigrade scale; according to the Fahrenheit scale.

2. Tell the freezing point of water according to the centigrade scale; according to the Fahrenheit scale.

3. How many degrees is it from the freezing point of water to the boiling point in the centigrade scale? in the Fahrenheit scale?

4. What is blood heat on the Fahrenheit scale? What is it on the centigrade scale? Does a person who has a temperature of 38° centigrade have a fever?

5. Suppose it is 0° on the Fahrenheit scale. What is the temperature on the centigrade scale? (—) means below zero.

6. When it is 40° below zero on the centigrade scale, what is the temperature on the Fahrenheit scale?

★7. Show that a temperature of 20° Fahrenheit would be **below 0°** on the centigrade scale.

Diagnostic Test in Addition of Decimal Fractions

Be sure to put the decimal points in the answers.

	a	b	c	d	e	
1.	.3	.4	.2	2.6	85.4	(162)
	.2	.5	.4	3.1	23.5	
2.	.8	.9	.3	4.8	96.8	(164)
	.4	.6	.7	3.5	85.9	
3.	.43	.26	.95	2.83	8.25	(173)
	.32	.38	.87	4.07	7.98	
4.	.253	.375	.842	8.325	9.784	(180)
	.213	.598	.739	7.569	8.597	

If you need help, turn to the pages at the right.

★Interesting Things to Look Up

If you have no work to correct on the test, look up one of the topics below.

1. The Dewey decimal system used in libraries.

2. The history of decimal fractions as given in a reference book.

3. Decimal fractions found in newspapers.

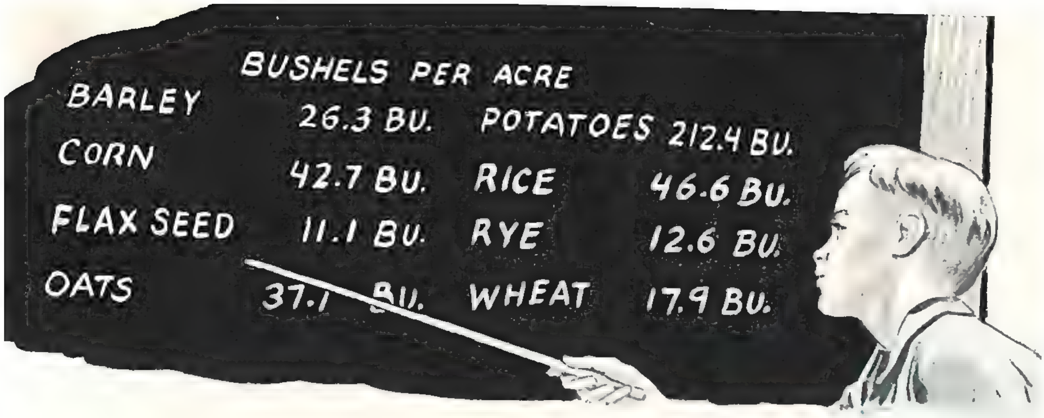
4. Decimal fractions in reference books and in textbooks of other fields of study.

5. Weather reports in newspapers.

6. How people use decimal fractions in industry.

7. The **mill** as a unit of money.

8. The use of decimal fractions in athletics.



How Large Are Our Crops?

John prepared a report about the average number of bushels **per** (on one) acre for some important crops.

1. Which crop produces the largest number of bushels per acre? Which produces the smallest?

2. How many more bushels per acre are there of potatoes than of rice? How many more than of corn?

3. How many fewer bushels of rye are produced per acre than of wheat? than of barley? than of oats?

4. A farmer produced 153.8 bushels of corn per acre. How much more than the average given above was this?

5. A farmer produced only 8.4 bushels of wheat per acre. How much below the average given above was this?

6. A Washington farmer produced on the average 28 bushels of wheat to the acre. At $2.50 a bushel, how much would he receive for the crop produced on an acre?

7. A Maine farmer produced on the average 212 bushels of potatoes to the acre. At $1.86 a bushel, how much would he receive per acre?

8. A farmer sold 37 bushels of oats at 26 cents a bushel. How much more would he receive at 80 cents a bushel?

★ 9. Find the number of pounds per bushel for each crop listed above.

Measuring the Food Value of Milk

To measure the food value of milk we find the amount of butterfat in the milk.

1. How much butterfat is there in one pound of the milk of a Jersey cow? of a Durham cow? of a Holstein cow?

Butterfat in 1 lb. of milk

Jersey	.052 lb.
Guernsey	.051 lb.
Durham	.040 lb.
Ayrshire	.036 lb.
Holstein	.034 lb.

2. How much more butterfat is there in one pound of Jersey milk than in one pound of Guernsey milk?

Think: .052 lb. − .051 lb. = ? lb.

$$\begin{array}{r} .052 \\ -.051 \\ \hline .001 \end{array}$$

When we subtract the numbers in thousandths' place, the remainder is 1 thousandth. We write in the two zeros to hold tenths' place and hundredths' place in the answer.

3. How much more butterfat is there per pound in Jersey milk than in Durham milk? than in Ayrshire milk? than in Holstein milk?

4. How much less butterfat is there per pound in Holstein milk than in Ayrshire milk? than in Durham milk? than in Guernsey milk?

5. In 100 pounds of Jersey milk there are on the average about 5.19 pounds of butterfat. In 100 pounds of Holstein milk there are about 3.43 pounds of butterfat. Find the difference.

★6. Find out what is meant by the $3\frac{1}{2}\%$ on the milk bottle top.

Diagnostic Test in Subtraction of Decimal Fractions

Be sure to put the decimal points in the answers.

	a	b	c	d	e	
1.	.5	.3	.8	6.8	8.4	(166)
	.4	.2	.4	5.3	2.1	
2.	1.3	1.4	1.1	9.2	87.5	(166)
	.7	.6	.8	4.6	29.6	
3.	.35	.86	.82	8.47	9.54	(174)
	.24	.56	.47	2.33	3.78	
4.	.483	.523	.485	8.596	7.142	(180)
	.251	.396	.391	5.478	4.356	

For help, turn to the page given at the right of the row.

Checking Up

This is a good time to check up on the new work we have studied this year.

Work the first two examples in each row of the following diagnostic tests. If you make any errors, work the whole row of examples.

1. Diagnostic test for two-place divisors, page 70.

2. Diagnostic test for three-place multipliers, page 141.

3. Diagnostic test for addition of unlike fractions, page 108.

4. Diagnostic test for subtraction of unlike fractions, page 117.

5. Diagnostic test for addition of decimal fractions, page 182.

Test in Addition and Subtraction of Decimals

1. $\begin{array}{r} 3.6 \\ +1.8 \\ \hline \end{array}$ 2. $\begin{array}{r} 26.895 \\ +34.962 \\ \hline \end{array}$ 3. $\begin{array}{r} .68 \\ +.74 \\ \hline \end{array}$ 4. $\begin{array}{r} .473 \\ +.267 \\ \hline \end{array}$ 5. $\begin{array}{r} .032 \\ +.046 \\ \hline \end{array}$

6. $\begin{array}{r} 4.3 \\ -2.6 \\ \hline \end{array}$ 7. $\begin{array}{r} 8.07 \\ -2.63 \\ \hline \end{array}$ 8. $\begin{array}{r} .857 \\ -.368 \\ \hline \end{array}$ 9. $\begin{array}{r} .18 \\ -.09 \\ \hline \end{array}$ 10. $\begin{array}{r} 1.46 \\ -1.37 \\ \hline \end{array}$

How Well Do You Understand Decimal Fractions?

1. Write as mixed numbers:

a. 1.3 b. 24.73 c. 5.027 d. 16.09

2. Write as decimal fractions:

a. $\frac{7}{10}$ b. $\frac{24}{100}$ c. $\frac{3}{1000}$ d. $\frac{9}{100}$

3. Write in decimal form:

a. Six and five hundredths b. Ten and one thousandth

4. Tell in what place 2 is written in each number below.

a. 3.2 b. 24.6 c. .342 d. 285.769 e. 1.529

★Just for Fun

1. Suppose that you did not know how to divide by a two-place number. How could you find the quotient of 256 ÷ 32?

a. You know that 4 × 8 = 32. What is the quotient when you divide 256 by 4?

(1) $4\overline{)256}$ with quotient 64 (2) $8\overline{)64}$ with quotient ? (3) $32\overline{)256}$ with quotient ?

b. If you now divide the quotient of 256 ÷ 4 by 8, what is the quotient you then get?

c. Now divide 256 by 32. Is the quotient the same as either quotient in a or b?

2. Use the same two ways to find the quotients below.

a. $18\overline{)162}$ b. $56\overline{)392}$ c. $63\overline{)378}$

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	345 753 735 262	4.56 6.40 4.12 3.84	.796 .869 .465 .671	97.2 395.0 38.4 508.1	\$ 8.38 9.90 97.17 8.22
2.	$3\frac{1}{8}$ $5\frac{3}{8}$	$6\frac{3}{4}$ $7\frac{3}{4}$	$7\frac{1}{2}$ $6\frac{1}{4}$	$5\frac{5}{6}$ $6\frac{2}{3}$	$9\frac{4}{5}$ $7\frac{3}{4}$

Practice Test in Subtraction

1.	9308 3015	17.723 9.824	1600.6 824.7	\$152.05 75.19	\$41.04 36.06
2.	8 $1\frac{3}{4}$	$6\frac{3}{8}$ $2\frac{7}{8}$	$5\frac{1}{2}$ $2\frac{1}{4}$	$6\frac{1}{3}$ $2\frac{5}{6}$	$9\frac{1}{4}$ $4\frac{2}{3}$

Practice Test in Multiplication

1.	438 39	139 76	793 28	\$36.90 80	\$36.84 57
2.	857 600	906 960	684 214	\$5.97 754	\$27.85 809

Practice Test in Division

1.	8)5184	6)4254	7)6862	9)63,720	5)53,829
2.	42)29,417	85)34,510	56)8568	34)8264	65)5213

How Well Do You Understand Our Number System?

1. How many places to the left of ones' place is hundreds' place? thousands' place? tens' place?

2. How many places to the right of ones' place is hundredths' place? thousandths' place? tenths' place?

3. How can we tell that a given number is a decimal? What does the zero before the decimal point show in 0.25?

4. Use the digits 2, 7, and 4 once each. Write the largest whole number possible; the largest decimal fraction possible.

5. Use the same digits once each. Write the smallest whole number possible; the smallest decimal fraction possible.

6. Use the digits 3, 6, and 0 once each. Write the largest whole number possible; the smallest decimal fraction possible.

7. The 3 in 34 is how many times as much as the 3 in 43?

8. The 3 in 23 is what fractional part of the 3 in 32?

9. The number of tenths in 1 is how many times as many as the number of tenths in .1?

10. How many tenths are there in 1.1?

11. Write with figures: ten million; one hundred thousand; 1 billion; one thousandth.

12. How many tens are there in 120? How many ones?

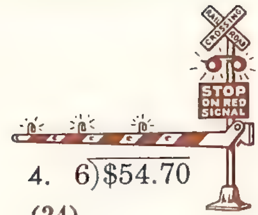
13. Does the place in which $\frac{1}{2}$ is written in the number $12\frac{1}{2}$ have any name?

14. Explain why .2 and .20 have the same value.

15. Write as decimals: 2 tenths; 2 hundredths; 2 thousandths.

16. Write as common fractions: .7; .009; .13.

★ 17. The 4 in 42 is how many times the 4 in .42? in 2.4?



Progress Test V

1. \$796.48 + 17.85 (10)	2. \$980.75 − 936.68 (15)	3. \$28.75 × 9 (19)	4. $6\overline{)\$54.70}$ (24)
5. $8\frac{3}{4} + 6\frac{1}{4}$ (91)	6. $\frac{3}{4} + \frac{2}{3}$ (104)	7. $8\frac{3}{4} - 4\frac{1}{4}$ (93)	8. $9\frac{1}{2} - 4\frac{7}{8}$ (113)
9. $\frac{1}{4}$ of \$.72 = (28)	10. 536 × 40 (19)	11. 807 × 706 (139)	12. \$6.50 × 590 (139)
13. 28.4 + 16.9 (162)	14. 8.975 + 7.468 (180)	15. 72.04 − 16.38 (174)	16. .048 − .029 (180)
17. $16\overline{)1284}$ (66)	18. $39\overline{)30,592}$ (60)	19. $78\overline{)52,260}$ (52)	20. $46\overline{)27,784}$ (31)

For help, turn to the page given below the number of the example.

★For Those with No Work to Correct

1. What is the smallest possible three-place decimal fraction? What is the largest possible three-place decimal fraction?

2. Use the digits 4, 1, and 9 only once each. Write the largest possible number; the smallest possible number.

3. Use the digits 3, 8, and 5 once each. Write the largest possible mixed decimal containing hundredths with 8 in hundredths' place; in tenths' place; in ones' place.

4. Arrange these numbers in order of their value, placing the number with the largest value first:

a. .65, .09, .875, .7, .125, .30.

b. 6.24, .675, 6.4, .68, 6.9, 6.08.

Test in Problem Solving V

1. If 4 yards of ribbon cost \$2.68, how much does the ribbon cost a yard?

2. Mary is $53\frac{1}{4}$ inches tall. Bob is $49\frac{1}{2}$ inches tall. How much taller than Bob is Mary?

3. Find the amount of lace needed for the edge of a square tablecloth that is $5\frac{1}{2}$ feet on a side.

4. Bob can run 50 yards in 7.1 seconds and Jim in 6.9 seconds. Find the difference in time.

5. At a $\frac{1}{3}$-off sale, Arthur bought a chemistry set that usually sold for \$7.50. How much did he pay for the set?

6. At 3 for 25 cents, how many valentines can you buy for a dollar?

7. What part of an hour is 36 minutes?

8. Patty read a 600-word story in 4 minutes. Mary read it in 5 minutes. How many more words per minute did Patty read on the average than Mary read?

9. Ann has a ribbon 10 feet long. She cuts off two pieces, one $3\frac{1}{2}$ feet long and one $2\frac{3}{4}$ feet long. How long is the piece remaining?

10. Tomatoes are on sale at 3 cans for 25 cents or 9 cents a can. How much is saved by buying 6 cans of tomatoes, 3 cans at a time, instead of single cans?

Did you beat your score on the last test?

CHAPTER VI

Fun in the Summer

1. It is $6\frac{3}{10}$ miles from the Jackson home to Forest Lake. It is $2\frac{7}{10}$ miles beyond Forest Lake to their cabin. How far is it from their home to the cabin and back home again?

2. Dick caught one bass weighing 4 pounds 10 ounces and another weighing 2 pounds 8 ounces. What was the total weight of the bass in pounds and ounces?

3. There is a village across the lake. It is $1\frac{3}{4}$ miles by motorboat from the Jackson cabin to the village. How many miles is it by motorboat to the village and back again?

4. Betty can swim 50 yards in $2\frac{1}{4}$ minutes. Dick can swim the distance in $1\frac{1}{2}$ minutes. How much less time does it take Dick than it takes Betty?

5. Dick sells frogs to fishermen at 3 for 25 cents. How much does he receive for a dozen frogs at this rate?

6. Betty and some friends left at 8:45 one morning on a hike to a waterfall. They returned at 4:30 that afternoon. How many hours long was the hike?

★7. Find out why there are hunting and fishing seasons.

Are You Ready for Multiplication of Fractions?

I. Be sure that you know how to reduce fractions to lowest terms.

Reduce the following fractions to lowest terms:

$\frac{6}{8}$ $\quad \frac{10}{12}$ $\quad \frac{15}{20}$ $\quad 5\frac{4}{16}$ $\quad 8\frac{12}{24}$

If you need help, turn to page 83.

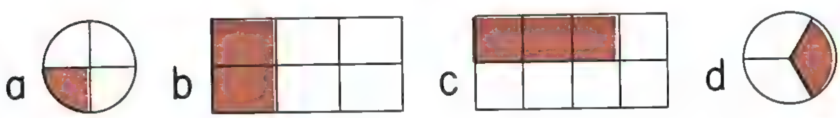
II. You may get answers like the fractions below. Express them in simplest form:

$\frac{12}{4}$ $\quad \frac{11}{4}$ $\quad \frac{3}{3}$ $\quad \frac{26}{4}$ $\quad \frac{90}{16}$ $\quad \frac{45}{24}$

If you need help, turn to page 89.

III. Check up on multiplication of whole numbers. Work the first two examples in each row in the diagnostic test on page 21.

IV. Be sure that you understand the meaning of fractions. What fractional part of each drawing below is shaded?



If you need help, turn to page 81.

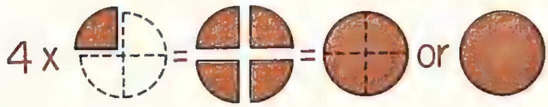
V. Use addition instead of multiplication to find the answers to the following:

1. Three 12's	3. Two $1\frac{1}{4}$'s	5. Four $2\frac{1}{2}$'s
2. Four 36's	4. Three $\frac{3}{4}$'s	6. Four $3\frac{2}{3}$'s

7. How much greater than one whole is the sum of the shaded parts in the drawings below?

Pictures Tell Multiplication Stories

1. We can picture the multiplication of fractions as shown below. Explain the story each set of drawings tells.

a 

$4 \times \frac{1}{4} = \frac{4}{4} = 1$

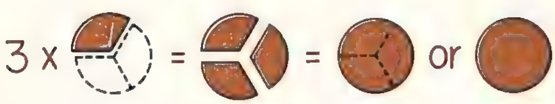
How much is $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$? Show this with cut-outs.

b 

$$3 \times \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}$$

How much is $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$? Show this with cut-outs.

2. Tell the stories each set of pictures below tells.

a 

b 

c 

3. What two examples are pictured by each set of drawings below? Show the answers with drawings.

a  b 

4. Picture each of the examples below with drawings.

a. $2 \times \frac{1}{2} = \frac{2}{2} = 1$

b. $2 \times \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

c. $4 \times \frac{1}{3} = \frac{4}{3} = 1\frac{1}{3}$

d. $4 \times \frac{1}{2} = \frac{4}{2} = 2$

Using Fractions in the Home

1. Jane made $1\frac{3}{4}$ pounds of walnut fudge and $2\frac{1}{2}$ pounds of chocolate fudge. How many pounds of fudge did she make? How many pounds more of chocolate fudge than of walnut fudge did she make?

2. Ann cut a ribbon $\frac{3}{4}$ yard long from a ribbon that was $1\frac{1}{2}$ yards long. How long was the piece of ribbon remaining?

3. Mrs. Clark bought $1\frac{1}{2}$ pounds of meat on each of three days. How many pounds of meat did she buy in three days?

4. Tom needs a board $3\frac{1}{2}$ feet long to make a shelf in his room. He has a board that is $2\frac{1}{2}$ feet long. How much too short is it?

5. Mary has only 3 apples to share equally with her three playmates. What part of an apple should each one receive? Use a drawing to picture how Mary can share the apples.

6. Keith is 5 feet $2\frac{1}{2}$ inches tall. How many inches tall is he?

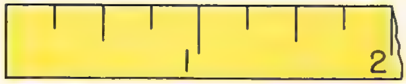
7. What part of the whole cake at the right are 4 pieces of the cake?

8. Helen plans to practice 45 minutes each day on the piano. What fraction of an hour is 45 minutes? How many hours would she practice at this rate in 6 days?

9. Grapefruit are on sale at 3 for 25 cents. How much would you have to pay for one grapefruit?

10. How much does $\frac{1}{2}$ pound of butter cost at $.74 a pound?

★11. How are fractions used in cooking and measuring foods?



Finding Products in Multiplication of Fractions

1. The example $2 \times \frac{1}{4}$ inch means that we are to find how much two $\frac{1}{4}$ inches are. Use the piece of ruler to show that $2 \times \frac{1}{4}$ inch $= \frac{2}{4}$ inch, or $\frac{1}{2}$ inch.

2. How much is $3 \times \frac{1}{4}$ inch?

Use the piece of ruler above to find the answers:

3. $4 \times \frac{1}{4}$ in. =
4. $5 \times \frac{1}{4}$ in. =
5. $6 \times \frac{1}{4}$ in. =
6. $7 \times \frac{1}{4}$ in. =
7. $8 \times \frac{1}{4}$ in. =
8. $2 \times \frac{1}{2}$ in. =
9. $3 \times \frac{1}{2}$ in. =
10. $4 \times \frac{1}{2}$ in. =
11. $2 \times \frac{3}{4}$ in. =

A Reminder

Be sure to remember these important points:

a. Reduce all fractions in answers to lowest terms.

b. Change all improper fractions to whole numbers or mixed numbers reduced to lowest terms.

Reduce the fractions below to lowest terms where this has not already been done.

1. $\frac{3}{4}$, $\frac{6}{8}$, $\frac{10}{12}$
2. $\frac{12}{16}$, $\frac{11}{15}$, $\frac{15}{20}$
3. $\frac{9}{10}$, $\frac{6}{10}$, $\frac{8}{10}$
4. $\frac{15}{25}$, $\frac{16}{40}$, $\frac{27}{40}$
5. $\frac{20}{50}$, $\frac{16}{48}$, $\frac{17}{51}$
6. $\frac{11}{44}$, $\frac{12}{27}$, $\frac{16}{32}$

Express these improper fractions in simplest form:

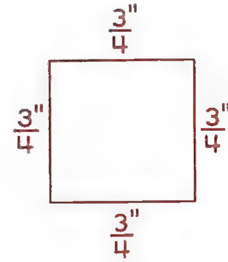
7. $\frac{15}{4}$, $\frac{4}{2}$, $\frac{4}{4}$
8. $\frac{18}{16}$, $\frac{12}{9}$, $\frac{6}{3}$
9. $\frac{17}{8}$, $\frac{7}{3}$, $\frac{2}{2}$
10. $\frac{10}{5}$, $\frac{10}{10}$, $\frac{10}{3}$
11. $\frac{12}{10}$, $\frac{16}{10}$, $\frac{20}{10}$
12. $\frac{8}{6}$, $\frac{10}{8}$, $\frac{3}{3}$

Practice What You Have Learned

1. $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} =$
2. $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} =$
3. $4\frac{1}{4} + 4\frac{1}{4} + 4\frac{1}{4} + 4\frac{1}{4} =$
4. $1\frac{5}{8} + 1\frac{5}{8} + 1\frac{5}{8} =$
5. $6\frac{7}{8} + 6\frac{7}{8} + 6\frac{7}{8} =$
6. $16\frac{1}{4} - 7\frac{1}{2} =$
7. $628 \times 7140 =$
8. $641{,}103 \div 87 =$

Multiplying Fractions by Whole Numbers

1. Find the perimeter of the square by adding the lengths of the four sides.



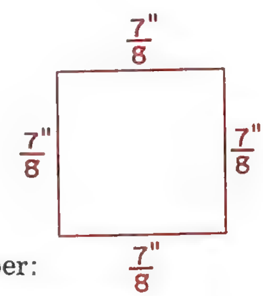
Think: $\frac{3}{4}'' + \frac{3}{4}'' + \frac{3}{4}'' + \frac{3}{4}'' = \frac{12}{4}''$ or 3 inches.

2. Another way to find the perimeter would be to find $4 \times \frac{3}{4}''$ since the four sides are equal. Study the work below. 4 × 3 fourths is 12 fourths, just as 4 × 3 cents is 12 cents.

$4 \times \frac{3}{4}\text{ in.} = \frac{4 \times 3}{4}\text{ in.} = \frac{12}{4}\text{ in.} = 3\text{ in.}$ $\qquad \frac{12}{4} = 4\overline{)12} = 3$

The answer is the same in problems 1 and 2.

3. Find the perimeter of this square by addition; then by multiplication.



4. How were the products below found?

a. $2 \times \frac{1}{3} = \frac{2 \times 1}{3} = \frac{2}{3}$

b. $3 \times \frac{3}{4} = \frac{3 \times 3}{4} = \frac{9}{4} = 2\frac{1}{4}$

To multiply a fraction by a whole number:

a. Multiply the numerator by the whole number.
b. Divide the product by the denominator.

MORE PRACTICE 356

Thus: $2 \times \frac{1}{4} = \frac{2 \times 1}{4} = \frac{2}{4} = \frac{1}{2}$

Multiply. Express the products in simplest form.

	a	b	c	d	e
5.	$2 \times \frac{1}{8} =$	$3 \times \frac{1}{8} =$	$4 \times \frac{1}{8} =$	$5 \times \frac{1}{8} =$	$6 \times \frac{1}{8} =$
6.	$2 \times \frac{3}{8} =$	$3 \times \frac{3}{8} =$	$4 \times \frac{3}{8} =$	$6 \times \frac{3}{8} =$	$8 \times \frac{3}{8} =$
7.	$5 \times \frac{1}{2} =$	$3 \times \frac{3}{4} =$	$2 \times \frac{7}{8} =$	$5 \times \frac{2}{3} =$	$6 \times \frac{2}{3} =$
8.	$3 \times \frac{1}{4} =$	$5 \times \frac{1}{6} =$	$4 \times \frac{7}{8} =$	$6 \times \frac{5}{6} =$	$10 \times \frac{5}{8} =$

Multiplying Whole Numbers by Fractions

You know that 2×3 has the same product as 3×2. In the same way $2 \times \frac{1}{3}$ and $\frac{1}{3} \times 2$ have the same product.

$$2 \times \frac{1}{3} = \frac{2 \times 1}{3} = \frac{2}{3} \qquad \frac{1}{3} \times 2 = \frac{1 \times 2}{3} = \frac{2}{3}$$

1. Go over the work below to see that it is correct.

$$1 \times \frac{1}{3} = \frac{1 \times 1}{3} = \frac{1}{3} \qquad \frac{1}{3} \times 1 = \frac{1 \times 1}{3} = \frac{1}{3}$$

$$2 \times \frac{1}{3} = \frac{2 \times 1}{3} = \frac{2}{3} \qquad \frac{1}{3} \times 2 = \frac{1 \times 2}{3} = \frac{2}{3}$$

$$3 \times \frac{1}{3} = \frac{3 \times 1}{3} = \frac{3}{3} = 1 \qquad \frac{1}{3} \times 3 = \frac{3}{3} = 1$$

$$4 \times \frac{1}{3} = \frac{4 \times 1}{3} = \frac{4}{3} = 1\tfrac{1}{3} \qquad \frac{1}{3} \times 4 = \frac{4}{3} = 1\tfrac{1}{3}$$

$$5 \times \frac{1}{3} = \frac{5 \times 1}{3} = \frac{5}{3} = 1\tfrac{2}{3} \qquad \frac{1}{3} \times 5 = \frac{5}{3} = 1\tfrac{2}{3}$$

$$6 \times \frac{1}{3} = \frac{6 \times 1}{3} = \frac{6}{3} = 2 \qquad \frac{1}{3} \times 6 = \frac{6}{3} = 2$$

$$7 \times \frac{1}{3} = \frac{7 \times 1}{3} = \frac{7}{3} = 2\tfrac{1}{3} \qquad \frac{1}{3} \times 7 = \frac{7}{3} = 2\tfrac{1}{3}$$

$$8 \times \frac{1}{3} = \frac{8 \times 1}{3} = \frac{8}{3} = 2\tfrac{2}{3} \qquad \frac{1}{3} \times 8 = \frac{8}{3} = 2\tfrac{2}{3}$$

$$9 \times \frac{1}{3} = \frac{9 \times 1}{3} = \frac{9}{3} = 3 \qquad \frac{1}{3} \times 9 = \frac{9}{3} = 3$$

2. Make multiplication tables like those above for $\frac{3}{4}$; $\frac{7}{8}$; $\frac{5}{12}$.

Multiply the following:

	a	b	c	d	e
3.	$5 \times \frac{1}{2} =$	$7 \times \frac{1}{5} =$	$\frac{1}{2} \times 4 =$	$6 \times \frac{5}{6} =$	$\frac{1}{2} \times 3 =$
4.	$\frac{3}{8} \times 7 =$	$4 \times \frac{1}{4} =$	$\frac{4}{5} \times 6 =$	$6 \times \frac{1}{8} =$	$7 \times \frac{1}{4} =$

5. How much is $\frac{1}{4}$ of 20? How much is $\frac{1}{4} \times 20$?
6. How much is $\frac{3}{4}$ of 20? How much is $\frac{3}{4} \times 20$?
7. How many inches are there in $\frac{3}{4}$ foot? in $\frac{5}{6}$ foot?
8. Find $\frac{3}{4}$ of 24; $\frac{5}{6}$ of 24; $\frac{3}{8}$ of 32; $\frac{2}{3}$ of 12.

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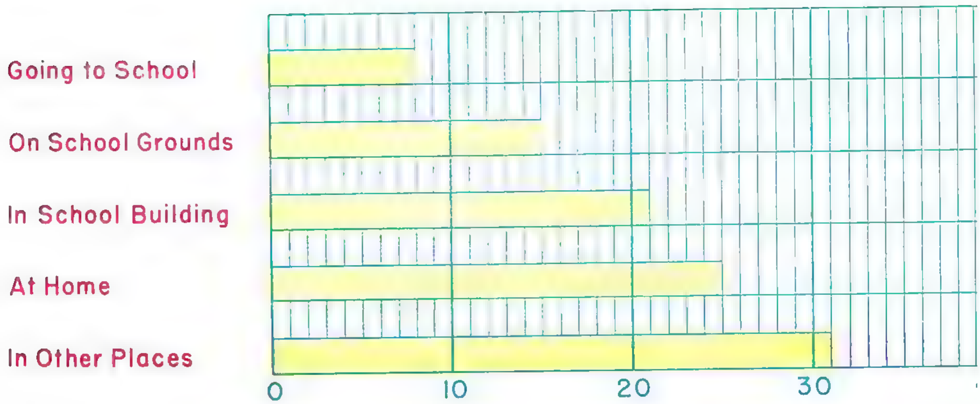


Where Accidents Occur to Children

1. Tell how many accidents out of one hundred occur when children are going to school. Tell how many occur on school grounds; in school buildings; at home; in other places. Where are some of the "other places" that accidents occur?

2. Where do the fewest accidents occur? the most accidents? How does the graph help you to tell?

(One out of a hundred means one-hundredth, or $\frac{1}{100}$ of the total number.)

3. Tell what fraction of all accidents occur on the way to school; on the school grounds; at home.

4. How many accidents in a hundred occur at school and on the way to school? Show that this is almost half of every hundred accidents.

5. How many more accidents in a hundred occur at home than on the school grounds?

6. How many accidents in a hundred occur at home, at school, and going to and from school? What fraction of all accidents occur in these three places?

★7. Where do the children in your school have accidents? Discuss ways of reducing the number of accidents.

A Penny for Twelve Minutes

In some places, the cost of parking an automobile is 5 cents an hour. The money is placed in a parking meter. People who wish to park less than an hour can put pennies in the meter. They put in one for each 12 minutes they wish to stay.

1. At 5 cents an hour for parking, how many minutes may one park for 1 cent?

2. A car can be parked for up to 12 minutes for 1 cent. How long can a car be parked for 2 cents? How long for 4 cents?

3. How many pennies must one pay to park a car for 36 minutes?

4. Why would it cost 2 cents to park a car for 20 minutes?

5. How much would it cost to park a car for 40 minutes? for 50 minutes? for 25 minutes?

6. How much would it cost to park a car for $\frac{1}{4}$ hour? How much to park a car from 3:30 to 4:00 in the afternoon?

★7. In many cities the cost of parking a car is 5 cents, sometimes 10 cents, for 1 hour or less. Which system is better, 1 cent for each 12 minutes or 5 cents for 1 hour or less?

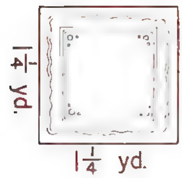
Finding Part of a Number

1. How many ounces are there in $\frac{3}{4}$ pound?

   Think: 16 oz. = 1 lb. $\frac{3}{4}$ of 16 = $\frac{3}{4} \times 16$ = ?

2. $\frac{3}{4}$ hr. = ? min.	5. $\frac{3}{4}$ ft. = ? in.	8. $\frac{1}{2}$ bu. = ? pk.
3. $\frac{1}{4}$ min. = ? sec.	6. $\frac{1}{2}$ yd. = ? in.	9. $\frac{3}{4}$ doz. = ?
4. $\frac{3}{4}$ gal. = ? qt.	7. $\frac{3}{4}$ bu. = ? qt.	10. $\frac{3}{4}$ ton = ? lb.

Multiplying Mixed Numbers by Whole Numbers



1. What is the total distance around the edge of this square tablecloth?

$1\frac{1}{4}$ yd. + $1\frac{1}{4}$ yd. + $1\frac{1}{4}$ yd. + $1\frac{1}{4}$ yd. = ? yd.

2. Get the answer by finding $4 \times 1\frac{1}{4}$.

$$\begin{array}{rl} 1\frac{1}{4} & \\ \times 4 & \\ \hline 1 & (4 \times \frac{1}{4}) \\ 4 & (4 \times 1) \\ \hline 5 & \end{array}$$

To multiply $1\frac{1}{4}$ by 4, first multiply $\frac{1}{4}$ by 4. $4 \times \frac{1}{4} = \frac{4}{4} = 1$. Write the 1 as shown at the left. Then multiply the 1 in $1\frac{1}{4}$ by 4. $4 \times 1 = 4$. Write the 4 under the 1. How much is $1 + 4$? Is this product the same as the sum in problem 1?

3. Explain the work below and show that it is correct.

a. $$\begin{array}{rl} 2\frac{1}{2} & \\ \times 5 & \\ \hline 2\frac{1}{2} & (5 \times \frac{1}{2}) \\ 10 & (5 \times 2) \\ \hline 12\frac{1}{2} & \end{array}$$

b. $$\begin{array}{rl} 7\frac{3}{8} & \\ \times 3 & \\ \hline 1\frac{1}{8} & (3 \times \frac{3}{8}) \\ 21 & (3 \times 7) \\ \hline 22\frac{1}{8} & \end{array}$$

c. $$\begin{array}{rl} 8\frac{1}{4} & \\ \times 2 & \\ \hline \frac{2}{4} & (2 \times \frac{1}{4}) \\ 16 & (2 \times 8) \\ \hline 16\frac{2}{4} & = 16\frac{1}{2} \end{array}$$

4. How much ribbon is needed for 4 bows if $1\frac{3}{4}$ yards are needed for each bow? Why can the answer not be as much as 8 yards?

5. Find the total weight of 5 chickens if their average weight is $3\frac{1}{2}$ pounds. Why must the answer be greater than 15 pounds?

Multiply. Go over your work to correct any errors.

	a	b	c	d	e	f
6.	$\begin{array}{r} 4\frac{1}{4} \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 4\frac{3}{8} \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 6\frac{3}{4} \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 7\frac{7}{8} \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 9\frac{3}{4} \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{5}{6} \\ 2 \\ \hline \end{array}$
7.	$\begin{array}{r} 4\frac{1}{2} \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{2} \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{3}{4} \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 9\frac{5}{8} \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 7\frac{5}{6} \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 8\frac{2}{3} \\ 4 \\ \hline \end{array}$

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EAD	POTATOES	SUGAR	FRUITS, VEGETABLES	BUTTER, FATS, OILS	MEAT	FISH	EGGS	MILK
			IN THE UNITED STATES					
lb.	$2\frac{3}{4}$ lb.	2 lb.	8 lb.	1 lb.	$2\frac{3}{4}$ lb.	$\frac{1}{4}$ lb.	6	7 pt.
			IN GREAT BRITAIN					
lb.	$3\frac{1}{2}$ lb.	2 lb.	5 lb.	$\frac{4}{5}$ lb.	$2\frac{1}{2}$ lb.	$\frac{1}{2}$ lb.	4	5 pt.

Our Neighbors' Food

This table shows the average amount of food eaten weekly by one person in the United States and in Great Britain.

1. Of which foods did the average person eat the same amounts weekly in the two countries?

2. Of which foods did the average person eat more weekly in the United States than in Great Britain? How much more of each kind?

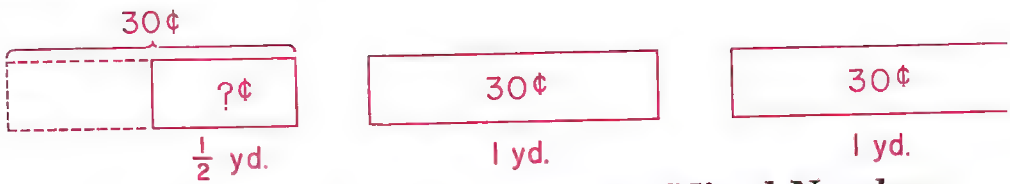
3. Of which foods did the average person eat less weekly in the United States than in Great Britain? How much less of each kind?

4. How many quarts of milk did the average person drink weekly in the United States? How many in Great Britain? Find the difference between the two amounts.

5. Find how many pounds of fish a family of 4 persons ate weekly in the United States; in Great Britain.

6. How many less pounds of potatoes did a family of 4 persons eat weekly in the United States than in Great Britain?

★7. Find the amount of each food eaten in each country in a year by one person. Count 52 weeks as a year. Make a neat list showing these amounts.



Multiplying Whole Numbers by Mixed Numbers

1. Find the cost of $2\frac{1}{2}$ yards of cloth at 30 cents a yard.

$$\begin{array}{rl} 30¢ & \\ \times 2\frac{1}{2} & \\ \hline 15 & (\frac{1}{2} \times 30) \\ 60 & (2 \times 30) \\ \hline 75¢ & \end{array}$$

First find the cost of $\frac{1}{2}$ yard. $\frac{1}{2} \times 30 = 15.$
Then find the cost of 2 yards. $2 \times 30 = 60.$
Then add the 15 and the 60.
The cost of the cloth is 75 cents.

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2. Find the cost of $2\frac{1}{4}$ yards of cloth at 40 cents a yard.
3. How many minutes are there in $2\frac{3}{4}$ hours?

Multiply. Go over your work carefully to check it.

	a	b	c	d	e	f
4.	$\begin{array}{r}12\\ \underline{4\frac{1}{2}}\end{array}$	$\begin{array}{r}16\\ \underline{2\frac{1}{8}}\end{array}$	$\begin{array}{r}24\\ \underline{3\frac{1}{4}}\end{array}$	$\begin{array}{r}35\\ \underline{4\frac{2}{5}}\end{array}$	$\begin{array}{r}\$.20\\ \underline{4\frac{3}{4}}\end{array}$	$\begin{array}{r}\$.16\\ \underline{3\frac{7}{8}}\end{array}$
5.	$\begin{array}{r}15\\ \underline{2\frac{1}{2}}\end{array}$	$\begin{array}{r}20\\ \underline{4\frac{3}{10}}\end{array}$	$\begin{array}{r}17\\ \underline{2\frac{1}{4}}\end{array}$	$\begin{array}{r}21\\ \underline{6\frac{5}{6}}\end{array}$	$\begin{array}{r}\$1.60\\ \underline{4\frac{5}{8}}\end{array}$	$\begin{array}{r}\$5.00\\ \underline{4\frac{3}{4}}\end{array}$

Practice What You Have Learned

	a	b	c	d	e	f
1.	$\begin{array}{r}7\frac{1}{3}\\ \underline{-2\frac{5}{6}}\end{array}$	$\begin{array}{r}9\frac{1}{2}\\ \underline{-2\frac{1}{2}}\end{array}$	$\begin{array}{r}.7\\ \underline{+.4}\end{array}$	$\begin{array}{r}36.47\\ \underline{-24.48}\end{array}$	$\begin{array}{r}6\frac{3}{8}\\ \underline{+5\frac{3}{4}}\end{array}$	$\begin{array}{r}26.4\\ \underline{+18.9}\end{array}$
2.	$\begin{array}{r}6\\ \underline{-2\frac{3}{4}}\end{array}$	$\begin{array}{r}6\frac{1}{2}\\ \underline{\times 4}\end{array}$	$\begin{array}{r}7\frac{2}{3}\\ \underline{+6\frac{3}{4}}\end{array}$	$\begin{array}{r}7\frac{1}{4}\\ \underline{-5\frac{3}{4}}\end{array}$	$\begin{array}{r}8\frac{1}{4}\\ \underline{\times 2}\end{array}$	$\begin{array}{r}4.86\\ \underline{+6.94}\end{array}$
3.	$\frac{2}{3} \times 5 =$	$\begin{array}{r}9\frac{3}{4}\\ \underline{+2\frac{5}{6}}\end{array}$	$\begin{array}{r}7.81\\ \underline{-2.93}\end{array}$	$\begin{array}{r}6\frac{3}{4}\\ \underline{\times 5}\end{array}$	$\begin{array}{r}8\frac{1}{2}\\ \underline{-6\frac{3}{4}}\end{array}$	$\begin{array}{r}9\\ \underline{\times 2\frac{1}{2}}\end{array}$

4. Divide the numbers below by 58; by 75; by 96.

a. 2784 b. 35967 c. 52490 d. 42340 e. 40484

Bill's Earnings

Bill earned money in the spring by raking lawns and clearing yards. He charged 40 cents an hour for his work. The list shows the people for whom he worked. It also shows the number of hours he worked for each one.

Homes	Time	Earnings
Mr. Brown	$3\frac{1}{4}$ hr.	b. ?
Mr. Adams	$2\frac{1}{2}$ hr.	c. ?
Mr. White	$4\frac{3}{4}$ hr.	d. ?
Mr. Salzman	4 hr.	e. ?
Total	a. ?	f. ?

1. Copy the list without the question marks. Find the total number of hours Bill worked for these people.

2. Find next how much Bill earned at each home.

3. Add to find the total amount Bill earned.

4. There is another way to find the total amount Bill earned. Multiply the total number of hours he worked (a) by the amount he earned an hour, 40 cents.

5. Bill raked Mr. Smith's lawn in 2 hours 45 minutes. How much did he earn? Think: 45 min. = ? hr.

6. Bill began raking another lawn at 8:30 A.M. and completed the work at 10:15 A.M. How much should he receive for this work?

★7. Bill worked for Mrs. Knight from 1:50 P.M. until 3:20 P.M. How much did he earn?

Diagnostic Test in Multiplication of Fractions and Whole Numbers

Find the products. Go over your work to check it.

	a	b	c	d	
1.	$\frac{1}{2} \times 4 =$	$\frac{1}{3} \times 6 =$	$\frac{2}{3} \times 9 =$	$\frac{3}{4} \times 12 =$	(197)
2.	$\frac{1}{3} \times 5 =$	$\frac{1}{4} \times 7 =$	$\frac{3}{4} \times 10 =$	$\frac{5}{6} \times 10 =$	(197)
3.	$4 \times \frac{1}{4} =$	$6 \times \frac{1}{8} =$	$8 \times \frac{3}{4} =$	$12 \times \frac{5}{6} =$	(196)
4.	$5 \times \frac{2}{3} =$	$4 \times \frac{3}{8} =$	$4 \times \frac{5}{6} =$	$10 \times \frac{3}{4} =$	(196)
5.	$\begin{array}{r} 6\frac{1}{2} \\ \underline{4} \end{array}$	$\begin{array}{r} 8\frac{1}{4} \\ \underline{4} \end{array}$	$\begin{array}{r} 9\frac{3}{4} \\ \underline{5} \end{array}$	$\begin{array}{r} 6\frac{5}{6} \\ \underline{8} \end{array}$	(200)
6.	$\begin{array}{r} 8 \\ \underline{3\frac{1}{4}} \end{array}$	$\begin{array}{r} 10 \\ \underline{4\frac{1}{2}} \end{array}$	$\begin{array}{r} 11 \\ \underline{3\frac{1}{8}} \end{array}$	$\begin{array}{r} 14 \\ \underline{2\frac{5}{6}} \end{array}$	(202)

Correct all errors in the test. If you need help, turn to the page given at the right of the row.

Checking Up

Work the first example in each row in the diagnostic tests on pages 108, 117, 182, and 185.

★Interesting Things to Look Up

1. How cloth is measured at the dry goods store.
2. Kinds of graphs found in newspapers and magazines.
3. What the numbers on radio dials mean.
4. Controls on modern gas and electric stoves.
5. Serial numbers on bicycles and automobile engines.
6. Record crops.
7. The meaning of "net weight."
8. How the sizes of gloves and mittens are indicated.
9. The meaning of "gross weight."

The Foods Children Should Eat Weekly

Ages in Years	Fruit and Vegetables lb.	oz.	Milk qt.	Meat lb.	oz.	Eggs no.	Cereals Flour lb.	oz.	Fats Oils lb.	oz.	Sugar lb.	oz.
1 to 3	5	12	6	0	12	6	1	4	0	2	0	2
4 to 6	7	12	6	1	4	7	1	8	0	6	0	8
7 to 9	9	8	$6\frac{1}{2}$	1	12	7	2	0	0	8	0	12
10 to 12	10	4	7	2	4	7	2	12	0	12	0	14

1. For what ages does the table give information?

2. Under each kind of food are given the amounts children of each age group should eat. How much fruit and vegetables should a child age 1 to 3 years eat? a child age 4 to 6 years? age 7 to 9 years? age 10 to 12 years?

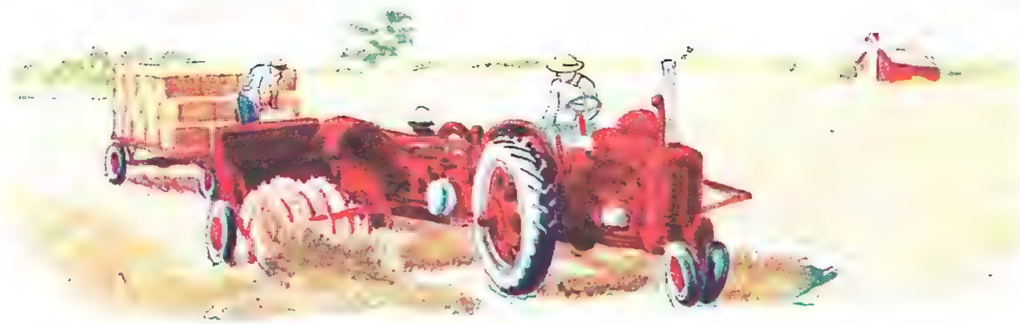
3. How much of each kind of food should an 11-year old child eat?

4. How many eggs should a 7- to 9-year-old child have a day? At 60 cents a dozen how much do 7 eggs cost?

5. How much less than 1 pound of sugar should a 4- to 6-year-old child eat in a week? a 12-year-old child?

6. Find the total weight of the foods given above that a 12-year-old child should eat in a week. Do not include eggs and milk. Find the total also for a 9-year-old child. Do you eat the right amounts of these foods?

★7. Make up five interesting problems about the foods that children should eat. Use facts from the table.



Arithmetic of the Dairy Farmer

The amount of land needed to produce food for one dairy cow for one year is given below.

Pasture	$\frac{3}{4}$ acre	Oats	$\frac{3}{4}$ acre	Silage	$1\frac{1}{8}$ acres
Hay	$1\frac{1}{4}$ acres	Barley	$\frac{7}{8}$ acre		

1. Find the total number of acres needed to produce the food consumed by one cow.

2. How much more land is needed for hay for one cow than for pasture? than for oats? than for barley?

3. How many acres of land are needed for pasture for a herd of 8 cows? of 12 cows? of 14 cows? of 17 cows?

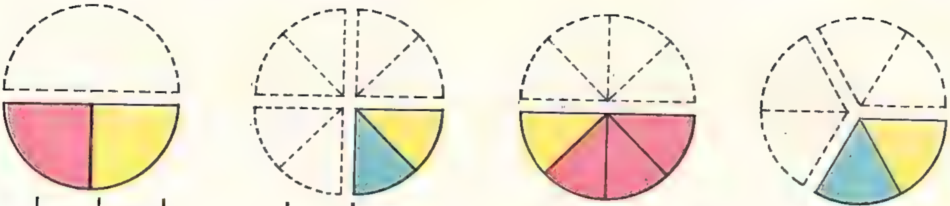
4. How many acres of land are needed to provide 10 cows with enough hay? oats? barley? silage?

5. A good cow produces about 12 quarts of milk a day. Allow 1 quart for each person a day. How many good cows will produce a day's supply of milk for a city of 12,000? of 240,000? of 3,600,000?

6. Find the cost of milk for a family of 4 persons for 1 week at 19 cents a quart. Allow $\frac{3}{4}$ quart a day for each person.

7. Suppose the price of milk rises 2 cents a quart. How much more will the cost of milk for 4 weeks be for a family of 4 persons? Allow $\frac{3}{4}$ quart a day for each person.

★8. A creamery sells milk by the quart at 19 cents and by the gallon at 68 cents. How much less would 28 quarts of milk cost by the gallon than by the quart?



A $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$ B $\frac{1}{2}$ of $\frac{1}{4} = ?$ C $\frac{1}{4}$ of $\frac{1}{2} = ?$ D $\frac{1}{2}$ of $\frac{1}{3} = ?$

Finding Parts of Fractions

1. Show that in A half of a half circle is yellow.

2. What part of the whole circle A is yellow? Use the drawing or your cut-outs to show that $\frac{1}{2}$ of $\frac{1}{2}$ is $\frac{1}{4}$.

3. What part of the whole circle B is blue and yellow? What part of a quarter circle is yellow in B? What part of a whole circle is $\frac{1}{2}$ of $\frac{1}{4}$ circle? Use your cut-outs to prove that $\frac{1}{2}$ of $\frac{1}{4}$ is $\frac{1}{8}$.

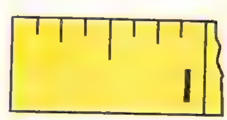
4. The heavy lines in C divide the half circle into four equal parts. Use the drawing to tell what part of a whole circle $\frac{1}{4}$ of $\frac{1}{2}$ circle is.

5. How much is $\frac{1}{2}$ of $\frac{1}{4}$ circle? How much is $\frac{1}{4}$ of $\frac{1}{2}$ circle?

6. Use drawing D to tell how much $\frac{1}{2}$ of $\frac{1}{3}$ circle is.

7. Use drawing D also to tell how much $\frac{1}{3}$ of $\frac{1}{2}$ circle is.

Use the piece of ruler to answer the problems below.



8. How much is $\frac{1}{2}$ of $\frac{1}{2}$ inch?

9. How much is $\frac{1}{2}$ of $\frac{1}{4}$ inch?

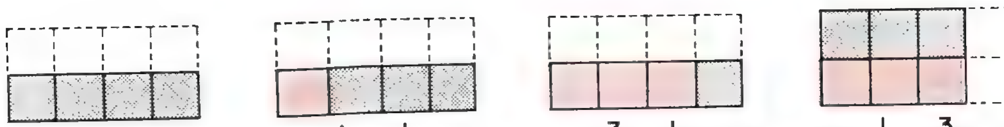
10. How much is $\frac{1}{4}$ of $\frac{1}{2}$ inch?

11. How much is $\frac{1}{2}$ of $\frac{3}{4}$ inch?

Just as $\frac{1}{2}$ of 4 means $\frac{1}{2} \times 4$, so $\frac{1}{2}$ of $\frac{1}{2}$ means $\frac{1}{2} \times \frac{1}{2}$. Also $\frac{1}{2}$ of $\frac{1}{4}$ means $\frac{1}{2} \times \frac{1}{4}$.

Practice What You Have Learned

	a	b	c	d
1.	$\frac{1}{2} + \frac{1}{4} =$	$\frac{3}{8} + \frac{4}{5} =$	$2\frac{1}{2} + 1\frac{3}{4} =$	$3.0 + 8.9 =$
2.	$\frac{3}{8} - \frac{1}{4} =$	$\frac{5}{6} - \frac{3}{4} =$	$8\frac{1}{4} - 3\frac{7}{8} =$	$5.64 - 3.27 =$



A $\frac{1}{2} = \frac{4}{8}$ B $\frac{1}{4}$ of $\frac{1}{2} = ?$ C $\frac{3}{4}$ of $\frac{1}{2} = ?$ D $\frac{1}{2}$ of $\frac{3}{4} = ?$

Multiplying Fractions by Fractions

1. What part of the rectangle in A is shaded?

2. What part of $\frac{1}{2}$ of the rectangle is brown in B? Use the drawing to tell what part of a whole rectangle $\frac{1}{4}$ of $\frac{1}{2}$ of it is.

3. We can find $\frac{1}{4}$ of $\frac{1}{2}$ by finding $\frac{1}{4} \times \frac{1}{2}$ as shown below.

$$\frac{1}{4} \times \frac{1}{2} = \frac{1 \times 1}{4 \times 2} = \frac{1}{8}$$

First multiply the two numerators. $1 \times 1 = 1$. Then multiply the two denominators. $4 \times 2 = 8$.

The product is $\frac{1}{8}$. The product is the same as the answer to problem 2.

4. Use the drawing in C to prove that $\frac{3}{4}$ of $\frac{1}{2}$ is $\frac{3}{8}$. Then multiply $\frac{3}{4} \times \frac{1}{2}$ to find what the product of the two fractions is. $\frac{3}{4} \times \frac{1}{2} = \frac{3 \times 1}{4 \times 2} = ?$

5. Use D to find how much $\frac{1}{2}$ of $\frac{3}{4}$ is. How much is $\frac{1}{2} \times \frac{3}{4}$?

6. Explain the steps in the work below.

a. $\frac{1}{2} \times \frac{1}{2} = \frac{1 \times 1}{2 \times 2} = \frac{1}{4}$

c. $\frac{1}{4} \times \frac{1}{2} = \frac{1 \times 1}{4 \times 2} = \frac{1}{8}$

b. $\frac{1}{2} \times \frac{1}{4} = \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$

d. $\frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} = \frac{1}{6}$

MORE PRACTICE 357

Copy and multiply. Go over your work to check it.

	a	b	c	d
7.	$\frac{3}{4} \times \frac{2}{3} =$	$\frac{3}{4} \times \frac{8}{9} =$	$\frac{3}{5} \times \frac{3}{8} =$	$\frac{9}{10} \times \frac{2}{3} =$
8.	$\frac{7}{10} \times \frac{3}{10} =$	$\frac{3}{10} \times \frac{7}{100} =$	$\frac{7}{100} \times \frac{3}{100} =$	$\frac{4}{10} \times \frac{3}{10} =$
9.	$\frac{1}{2} \times \frac{1}{4} =$	$\frac{1}{3} \times \frac{1}{2} =$	$\frac{1}{4} \times \frac{1}{2} =$	$\frac{2}{3} \times \frac{1}{2} =$

10. How many minutes are there in half of a quarter hour?

11. How many minutes are there in half of a half hour?

★A Short Cut in Multiplying Fractions

When we work the example $\frac{3}{4} \times \frac{5}{6}$, we first multiply. Then we reduce the fraction.

$$\frac{3}{4} \times \frac{5}{6} = \frac{3 \times 5}{4 \times 6} = \frac{15}{24} = \frac{5}{8}$$

1. By what number do we divide both numerator and denominator of $\frac{15}{24}$ to get $\frac{5}{8}$?

We Can Divide before We Multiply

Some people divide a numerator and a denominator by the same number before they multiply, as shown below:

$$\frac{\overset{1}{\cancel{3}}}{4} \times \frac{5}{\underset{2}{\cancel{6}}} = \frac{1 \times 5}{4 \times 2} = \frac{5}{8}$$

You can see that 3 and 6 are both divided by 3.

$3\overline{)3} = ?$ $3\overline{)6} = ?$ The numbers divided by 3 are both **cancelled**, as shown above. Be sure to multiply the right numbers, as shown above.

2. In the example $\frac{5}{9} \times \frac{6}{7}$, which numerator and which denominator can both be divided by 3? Explain each step in the work at the left. Find the product also by multiplying before you divide. Which way seems easier? Why?

$$\frac{5}{\underset{3}{\cancel{9}}} \times \frac{\overset{2}{\cancel{6}}}{7} = \frac{5 \times 2}{3 \times 7} = ?$$

3. Explain the work in the examples below:

a. $\frac{\overset{3}{\cancel{9}}}{\underset{5}{\cancel{10}}} \times \frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{3}}} = \frac{3 \times 1}{5 \times 1} = \frac{3}{5}$

b. $\frac{\overset{1}{\cancel{4}}}{\underset{3}{\cancel{9}}} \times \frac{\overset{5}{\cancel{15}}}{\underset{4}{\cancel{16}}} = \frac{1 \times 5}{3 \times 4} = \frac{5}{12}$

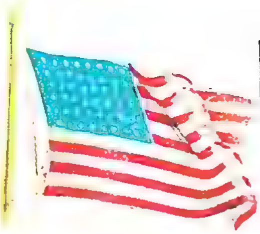
4. Now work the examples. Multiply before you divide.

Find the products. Divide before you multiply.

5. $\frac{3}{8} \times \frac{4}{5} =$ 7. $\frac{4}{9} \times \frac{9}{16} =$ 9. $\frac{5}{6} \times \frac{4}{10} =$ 11. $\frac{7}{10} \times \frac{5}{9} =$

6. $\frac{5}{6} \times \frac{3}{10} =$ 8. $\frac{5}{8} \times \frac{2}{3} =$ 10. $\frac{14}{25} \times \frac{5}{7} =$ 12. $\frac{3}{8} \times \frac{12}{21} =$

MORE PRACTICE 357

Fractions in Music

1. The line of music above is written in "three-four" time. How can you tell?

2. The $\frac{3}{4}$ at the left is called the **time signature.** The 3 tells us that there are 3 counts or beats to a measure. The 4 tells us that a quarter note gets one count or beat. The number $\frac{3}{4}$ means that 3 quarter notes make up one **measure.** This is true for any group of notes that have the same value as 3 quarter notes.

Which of the notes below is a whole note? a half note? a quarter note? an eighth note? a sixteenth note?

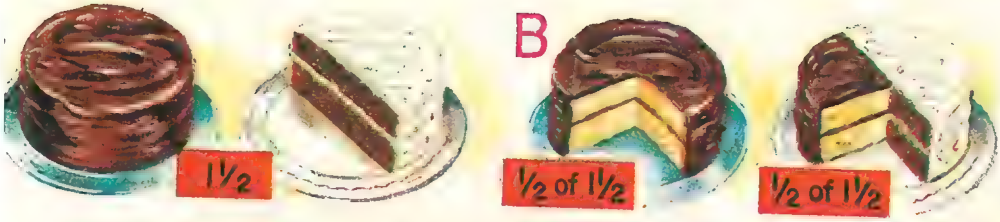
3. What notes do you see in the first measure in the song? What is the total value of the notes?

4. Find the sum of the values of the notes in the second measure. Is their value the same as 3 quarter notes?

5. In the third measure you see a dotted eighth note:  A dot after a note adds half of its value to the note. How much is $\frac{1}{2}$ of $\frac{1}{8}$? What is the value of a dotted eighth note?

6. Find the value of a dotted half note; of a dotted quarter note. Find the value of the notes in the third measure.

★ 7. Find the value of the note missing in each **bar** below:



Multiplying Fractions and Mixed Numbers

1. Suppose that there are $1\frac{1}{2}$ cakes to be shared by 2 families. How much would $\frac{1}{2}$ of the $1\frac{1}{2}$ cakes be?

Use the drawings to prove that $\frac{1}{2}$ of $1\frac{1}{2}$ cakes is $\frac{3}{4}$ cake.

2. To find $\frac{1}{2}$ of $1\frac{1}{2}$ we can multiply as explained below.

$\frac{1}{2} \times 1\frac{1}{2} =$	First change $1\frac{1}{2}$ to $\frac{3}{2}$.
$\frac{1}{2} \times \frac{3}{2} = \frac{1 \times 3}{2 \times 2} = \frac{3}{4}$	Then multiply the two fractions. Explain each step in the work.

3. Use a ruler to find $\frac{1}{2}$ of $1\frac{1}{4}$ inches.

4. Explain how we multiply $\frac{1}{2} \times 1\frac{1}{4}$ below.

$\frac{1}{2} \times 1\frac{1}{4} =$	How do we change $1\frac{1}{4}$ to $\frac{5}{4}$?
$\frac{1}{2} \times \frac{5}{4} = \frac{1 \times 5}{2 \times 4} = \frac{5}{8}$	How do we get the $\frac{5}{8}$?

5. Tell how to find the products in the examples below.

a. $\frac{1}{3} \times 1\frac{1}{4} =$	b. $1\frac{1}{2} \times \frac{3}{4} =$	c. $\frac{2}{3} \times 1\frac{1}{2} =$
$\frac{1}{3} \times \frac{5}{4} = \frac{5}{12}$	$\frac{3}{2} \times \frac{3}{4} = \frac{9}{8} = 1\frac{1}{8}$	$\frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1$

Copy and multiply. Go over your work to check it.

	a	b	c	d
6.	$\frac{1}{2} \times 1\frac{1}{4} =$	$\frac{1}{3} \times 1\frac{1}{5} =$	$\frac{3}{4} \times 1\frac{1}{2} =$	$2\frac{1}{4} \times \frac{2}{3} =$
7.	$1\frac{1}{2} \times \frac{1}{3} =$	$1\frac{1}{4} \times \frac{4}{5} =$	$2\frac{1}{2} \times \frac{2}{3} =$	$2\frac{1}{4} \times \frac{5}{6} =$
8.	$\frac{2}{3} \times 2\frac{1}{4} =$	$2\frac{1}{4} \times \frac{4}{7} =$	$\frac{3}{4} \times 1\frac{1}{5} =$	$1\frac{1}{2} \times \frac{2}{3} =$

MORE PRACTICE

9. Use a ruler to find $\frac{1}{4}$ of $1\frac{1}{2}$ inches. Prove by multiplication that your answer is correct.

357
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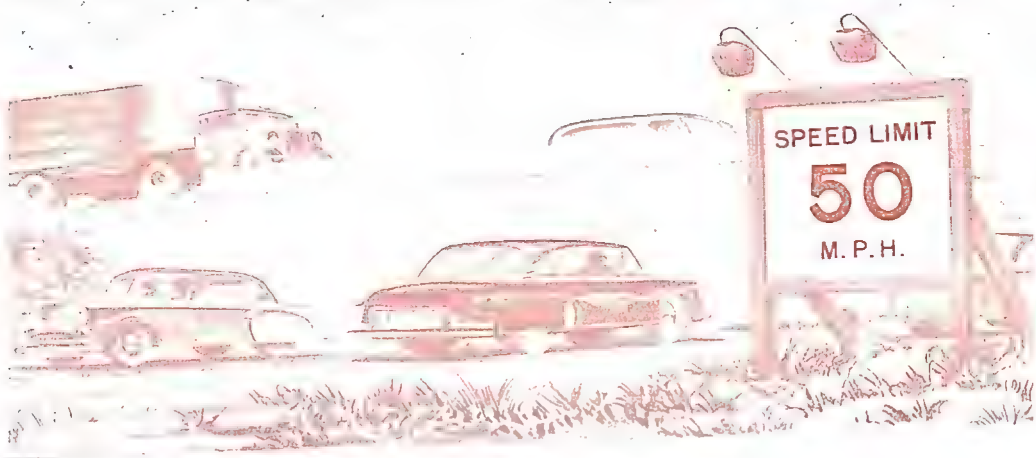
10. Divide each number below by 75; by 17; by 26.

a. 3600 b. 45,950 c. 67,875 d. 54,775 e. 53,350



"You Are Going Too Fast"

1. "You are going 60 miles an hour, Tom," his mother said. How much faster than the speed limit shown on the sign was Tom going?

2. How many minutes does it take a car to go a mile at 60 miles an hour?

3. How many minutes does it take a car to go 20 miles at 60 miles an hour?

4. Suppose that a car is going at the rate of a mile a minute. Show that it is going at the rate of 88 feet a second. Measure a distance of 88 feet on some sidewalk.

5. A car is moving at the rate of 30 miles an hour. In how many minutes does it go 1 mile? 20 miles?

6. In how many hours does a car go 100 miles at 50 miles an hour? at 40 miles an hour?

7. How many miles will a car go in 1 hour at an average speed of $\frac{3}{4}$ miles a minute?

8. How much farther does a car travel in $2\frac{1}{2}$ hours at 50 miles an hour than at 45 miles an hour?

★9. What are the speed limits for automobiles on streets and highways where you live?

A $3\frac{3}{4} = \frac{?}{4}$ B $4\frac{2}{3} = \frac{?}{3}$ C $5\frac{1}{2} = \frac{?}{2}$

Changing Mixed Numbers to Improper Fractions

1. Count the quarter circles in the $3\frac{3}{4}$ circles in A. Another way to show that $3\frac{3}{4}$ is $\frac{15}{4}$ is as follows:

$1 = \frac{4}{4}$. $3 = 3 \times \frac{4}{4} = \frac{12}{4}$. So $3\frac{3}{4} = \frac{12}{4} + \frac{3}{4} = \frac{15}{4}$.

2. Use B above to show that $4\frac{2}{3} = \frac{14}{3}$. Then use the method explained above to change $4\frac{2}{3}$ to thirds.

3. Find the missing numerators below:

a. $2\frac{3}{4} = \frac{?}{4}$ b. $3\frac{2}{3} = \frac{?}{3}$ c. $4\frac{7}{8} = \frac{?}{8}$ d. $4\frac{1}{2} = \frac{?}{2}$

4. Use C to show that $5\frac{1}{2} = \frac{11}{2}$

There is a quick way to change $5\frac{1}{2}$ to halves. Multiply the 5 by 2 ($5 \times 2 = 10$). Then add the 1 (in $\frac{1}{2}$) to the 10. $10 + 1 = 11$. So $5\frac{1}{2} = 11$ halves or $\frac{11}{2}$.

5. Use this method to change $3\frac{3}{4}$ to $\frac{15}{4}$.

Change the mixed numbers below to improper fractions.

6. $5\frac{1}{2}$, $4\frac{2}{3}$, $6\frac{1}{4}$ 7. $3\frac{1}{3}$, $2\frac{5}{8}$, $3\frac{4}{5}$ 8. $5\frac{3}{4}$, $7\frac{5}{8}$, $4\frac{5}{6}$

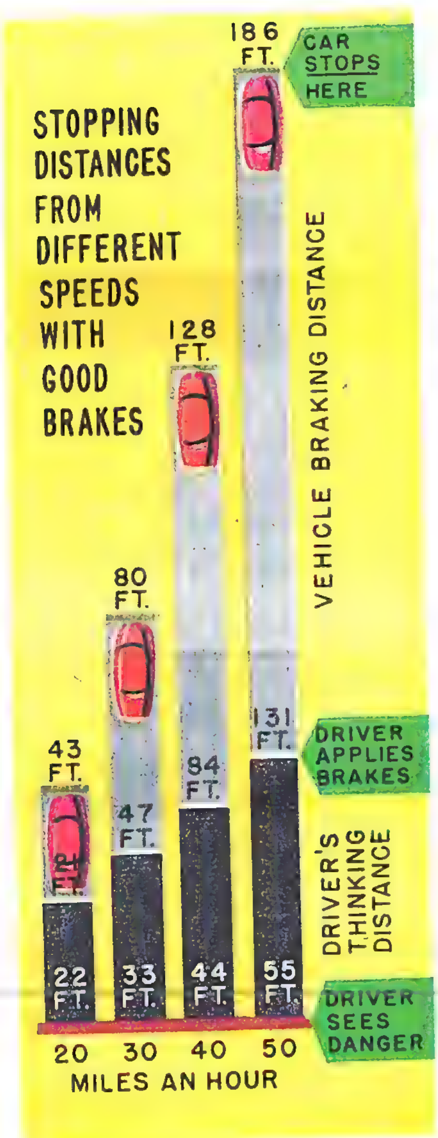
Practice What You Have Learned

	a	b	c	d	e
1.	$4 \times 1\frac{3}{4}$	$2\frac{1}{4} \times 5$	$\frac{3}{4} \times 6$	$3 \times \frac{1}{6}$	$4 \times \frac{1}{4}$
2.	$\frac{2}{3} \times \frac{3}{5}$	$\frac{4}{7} \times 1\frac{1}{2}$	$1\frac{1}{4} \times \frac{4}{5}$	$\frac{1}{3} \times 1\frac{1}{2}$	$\frac{4}{9} \times \frac{3}{4}$
3.	$6\frac{1}{2} + 5\frac{3}{4}$	$9\frac{1}{3} \times \frac{5}{6}$	$6 - 4\frac{1}{2}$	$6 \times 4\frac{1}{2}$	$\frac{1}{2} \times 1\frac{1}{3}$
4.	$\begin{array}{r} 6.4 \\ +7.8 \\ \hline \end{array}$	$\begin{array}{r} .65 \\ +.79 \\ \hline \end{array}$	$\begin{array}{r} 8.4 \\ -2.1 \\ \hline \end{array}$	$\begin{array}{r} .97 \\ -.59 \\ \hline \end{array}$	$\begin{array}{r} 3.1 \\ -2.8 \\ \hline \end{array}$

5. Divide each number below by 19; by 37; by 46.

a. 912 b. 11,628 c. 17,195 d. 13,870 e. 13,262

It Pays to Have Good Brakes



1. What is the title of this graph?

2. For what speeds are stopping distances given?

3. A car is traveling at the rate of 50 miles an hour. The driver sees danger. According to the graph, how many feet does the car go before he applies the brakes? How much farther does the car go before it comes to a stop?

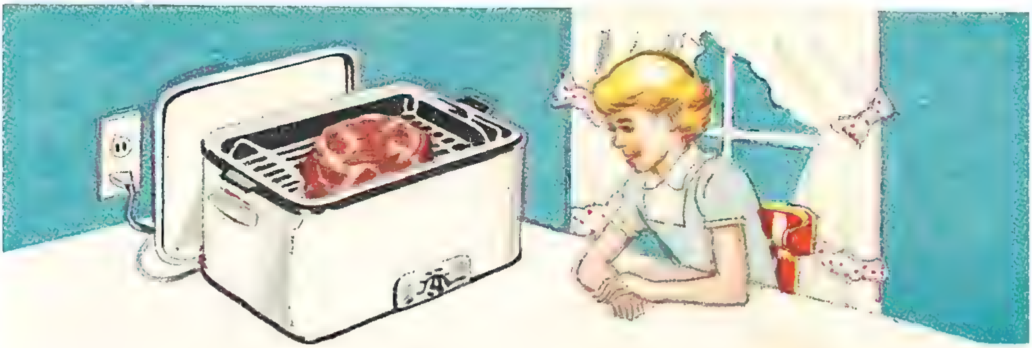
4. What is the braking distance for a car going 50 miles an hour? How much longer than for a car going 40 miles an hour? 30 miles an hour? 20 miles an hour?

5. A car is traveling at the rate of 30 miles an hour. How many feet does it go in 1 second?

6. It takes a driver $\frac{3}{4}$ second to apply the brakes after he sees danger. How many feet will the car travel in this time when moving at the rate of 44 feet a second? at the rate of 66 feet a second?

7. The driver of a car with good brakes is going 50 miles an hour. Suddenly he sees a child on the road about 50 yards ahead. Will he be able to stop the car in time? How does the graph help you to tell?

★8. How is the braking distance changed by icy streets? by wet pavements? by poor brakes?



Multiplying Mixed Numbers and Fractions

1. The cost of the electricity used by the roaster is $3\frac{1}{2}$ cents an hour. How much would it cost to roast meat for $2\frac{1}{2}$ hours? How much is $2\frac{1}{2} \times 3\frac{1}{2}$ cents?

$$2\frac{1}{2} \times 3\frac{1}{2} =$$

$$\frac{5}{2} \times \frac{7}{2} = \frac{35}{4} = 8\frac{3}{4}$$

First change both mixed numbers to improper fractions. How do we get $\frac{5}{2}$? $\frac{7}{2}$?
How do we get the $\frac{35}{4}$? the $8\frac{3}{4}$?
Why is $8\frac{3}{4}$¢ a sensible answer?

2. Explain each step in the examples below.

a. $2\frac{1}{2} \times 3\frac{1}{4} =$
$\frac{5}{2} \times \frac{13}{4} = \frac{65}{8} = 8\frac{1}{8}$

b. $\frac{1}{4} \times 3\frac{3}{5} =$
$\frac{1}{4} \times \frac{18}{5} = \frac{18}{20} = \frac{9}{10}$

c. $3\frac{1}{3} \times 1\frac{1}{5} =$
$\frac{10}{3} \times \frac{6}{5} = \frac{60}{15} = 4$

3. How can you tell that the answer to a must be more than 6 but less than 12? How can you tell that the product in b must be less than 1? in c more than 3?

	a	b	c	d
4.	$3\frac{1}{2} \times 3\frac{1}{4} =$	$\frac{3}{4} \times 3\frac{1}{3} =$	$5\frac{5}{8} \times 1\frac{1}{9} =$	$7\frac{1}{2} \times 3\frac{1}{5} =$
5.	$2\frac{1}{2} \times \frac{3}{4} =$	$4\frac{1}{5} \times 3\frac{1}{3} =$	$\frac{1}{2} \times 2\frac{1}{7} =$	$3\frac{3}{4} \times 4\frac{2}{5} =$
6.	$4\frac{3}{4} \times 2\frac{2}{3} =$	$2\frac{1}{2} \times 3\frac{1}{4} =$	$6\frac{1}{2} \times 2\frac{2}{5} =$	$1\frac{1}{2} \times 2\frac{1}{3} =$
7.	$2\frac{2}{3} \times 2\frac{1}{2} =$	$6\frac{1}{4} \times \frac{2}{3} =$	$4\frac{1}{2} \times 2\frac{2}{3} =$	$5\frac{3}{5} \times \frac{5}{6} =$

MORE PRACTICE 358

8. At $2\frac{1}{4}$ cents an hour, what is the cost of using an electric iron for $2\frac{1}{3}$ hours? for 40 minutes?

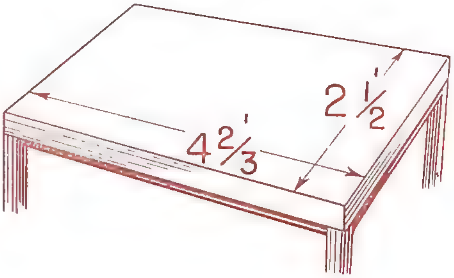
★ 9. Prove that the product of $2\frac{1}{2} \times 3\frac{1}{2}$ is the same as the sum of $2 \times 3\frac{1}{2} + \frac{1}{2} \times 3\frac{1}{2}$.

★You Can Divide Before You Multiply

1. What is the area of this table top?

A. $4\frac{2}{3} \times 2\frac{1}{2} =$

$$\frac{14}{3} \times \frac{5}{2} = \frac{70}{6} = 11\frac{4}{6} = 11\frac{2}{3}$$



In A we divide **after** we multiply. Explain how. The area is $11\frac{2}{3}$ sq. ft.

B. $4\frac{2}{3} \times 2\frac{1}{2} =$

$$\frac{\overset{7}{\cancel{14}}}{3} \times \frac{5}{\underset{1}{\cancel{2}}} = \frac{35}{3} = 11\frac{2}{3}$$

In B we divide 14 and 2 by 2 **before** we multiply. Explain the work.

2. Explain the work below. Check with method A.

a. $5\frac{5}{6} \times 1\frac{5}{7} =$

$$\frac{\overset{5}{\cancel{35}}}{\underset{1}{\cancel{6}}} \times \frac{\overset{2}{\cancel{12}}}{\underset{1}{\cancel{7}}} = \frac{5 \times 2}{1 \times 1} = \frac{10}{1} = 10$$

b. $\frac{3}{4} \times 1\frac{1}{9} =$

$$\frac{\overset{1}{\cancel{3}}}{\underset{2}{\cancel{4}}} \times \frac{\overset{5}{\cancel{10}}}{\underset{3}{\cancel{9}}} = \frac{1 \times 5}{2 \times 3} = \frac{5}{6}$$

3. How much do $\frac{3}{4}$ dozen eggs weigh if one dozen eggs weigh $1\frac{1}{2}$ pounds?

MORE PRACTICE

Find the products below. Use methods A and B for rows 4 and 5, and any method you wish for rows 6 and 7.

	a	b	c	d
4.	$\frac{3}{4} \times 2\frac{5}{6} =$	$4\frac{2}{5} \times \frac{5}{8} =$	$\frac{1}{4} \times 3\frac{1}{5} =$	$1\frac{1}{4} \times \frac{4}{5} =$
5.	$4\frac{1}{5} \times 2\frac{2}{3} =$	$2\frac{1}{2} \times 1\frac{1}{3} =$	$4\frac{5}{6} \times 5\frac{1}{4} =$	$4\frac{1}{4} \times 6\frac{2}{3} =$
6.	$3\frac{3}{5} \times 3\frac{1}{8} =$	$9\frac{1}{3} \times 2\frac{1}{4} =$	$7\frac{1}{3} \times 2\frac{2}{5} =$	$\frac{2}{3} \times 5\frac{5}{6} =$
7.	$9\frac{1}{3} \times 3\frac{3}{7} =$	$2\frac{2}{3} \times 4\frac{1}{2} =$	$\frac{1}{3} \times 4\frac{1}{5} =$	$\frac{3}{8} \times 3\frac{5}{9} =$

8. Find the area of a room $12\frac{2}{3}$ feet long and $9\frac{3}{4}$ feet wide.

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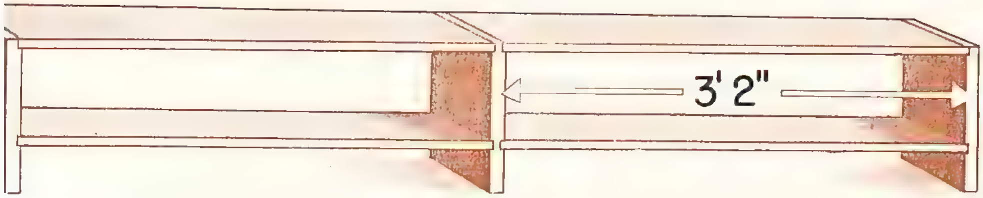
9. Find the perimeter of a $20\frac{1}{2}$ foot square rug.



Multiplying Measures

1. Bobby needs 4 boards, each 3 feet 2 inches long, for a book shelf. How many feet of lumber does he need?

Method I

3 ft. 2 in.	Multiply 2 in. by 4. This is 8 in.
×4	Multiply 3 ft. by 4. This is 12 ft.
12 ft. 8 in.	Show that 12 ft. 8 in. $= 12\frac{2}{3}$ ft.
	Check the answer by addition.

Method II

Change 3 ft. 2 in. to feet. 3 ft. 2 in. $= 3\frac{2}{12}$ ft. or $3\frac{1}{6}$ ft.
$4 \times 3\frac{1}{6}$ ft. $= 12\frac{4}{6}$ ft. $= 12\frac{2}{3}$ ft. Check by addition.

2. Explain the work shown below.

I. 3 gal. 2 qt.
×3
9 gal. 6 qt. =
10 gal. 2 qt.,
or $10\frac{1}{2}$ gal.

II. 3 gal. 2 qt. $= 3\frac{1}{2}$ gal.

$3 \times 3\frac{1}{2} = 3 \times \frac{7}{2} = \frac{21}{2} = 10\frac{1}{2}$

The result is the same as for **I.**

3. Use both methods to find the products of the following:

a. 5 hr. 15 min. ×8

b. 4 ft. 8 in. ×2

c. 2 lb. 8 oz. ×6

4. A motorboat goes a mile in 1 minute 30 seconds. How long does it take the motorboat to go 7 miles?

Use the method you prefer to find the products below.

5. 3 min. 15 sec. ×4

6. 2 lb. $4\frac{1}{2}$ oz. ×3

7. 8 ft. $7\frac{1}{2}$ in. ×2

8. 3 yd. 2 ft. ×6

9. 4 qt. 1 pt. ×5

10. 2 hr. 42 min. ×6

MORE PRACTICE 358

From the Back of a Sheep to My Back

1. Lambs weigh about $9\frac{1}{2}$ pounds when born. They double their weight in 15 days. How much do they then weigh?

2. The wool (or fleeces) clipped from 68 sheep weighed 578 pounds. What was the average weight of the fleece from each sheep?

3. About $\frac{3}{5}$ of the weight of a fleece is dirt and grease. What is the weight of the wool in a fleece that weighs $8\frac{1}{3}$ pounds?

4. Mr. Smith sold 150 pounds of wool at 40 cents a pound. How much did he receive for the wool?

5. Yarn is often sold by the ounce. How much did Mr. Smith receive for one ounce of wool?

6. Mary is knitting a crib blanket. She uses baby yarn costing 43 cents for a 1-ounce skein. How much does one pound of the yarn cost?

7. Ann is knitting herself a sport jacket. The yarn costs 64 cents for a 2-ounce skein. At that price how much does one pound of this yarn cost?

8. Patty is knitting a sweater with heavy yarn costing 95 cents for a 4-ounce skein. The sweater will weigh 12 ounces. How much will the yarn for the sweater cost?

9. The wool for a \$30.00 boy's suit weighs $1\frac{3}{4}$ pounds. Find the value of the wool at \$1.80 a pound.

★10. Why does the suit cost so much more than the wool it contains?

Another Way to Multiply Whole Numbers and Mixed Numbers

1. How much does a $3\frac{1}{2}$-pound chicken cost at \$.50 a pound?

A. $$\begin{array}{r} \$.50 \\ \times 3\frac{1}{2} \\ \hline 25 \ (\frac{1}{2} \times 50) \\ 150 \ (3 \times 50) \\ \hline \$1.75 \end{array}$$

B. $3\frac{1}{2} \times \$.50 =$

$$\frac{7}{2} \times \$.50 = \frac{\$3.50}{2} = \$1.75$$

In A we multiply by the method shown on page 202. In B we change $3\frac{1}{2}$ to an improper fraction and multiply.

Sometimes it is easier to use method B than method A.

Use method B in these examples. Check with method A.

	a	b	c	d
2.	$4\frac{2}{3} \times 13 =$	$3\frac{3}{4} \times 14 =$	$7\frac{3}{4} \times 15 =$	$8\frac{5}{6} \times 20 =$
3.	$18 \times 3\frac{3}{4} =$	$12 \times 2\frac{2}{5} =$	$3\frac{2}{3} \times 8 =$	$3\frac{4}{5} \times 17 =$

Use the method that seems most sensible in these examples:

	a	b	c	d
4.	$6\frac{1}{2} \times 18 =$	$6\frac{1}{4} \times 15 =$	$8\frac{1}{3} \times 26 =$	$7\frac{3}{4} \times 40 =$
5.	$12 \times 6\frac{1}{2} =$	$12 \times 4\frac{2}{5} =$	$27 \times 3\frac{2}{3} =$	$17 \times 3\frac{3}{5} =$
6.	$3\frac{1}{3} \times 30 =$	$20 \times 2\frac{2}{5} =$	$34 \times 3\frac{1}{4} =$	$2\frac{7}{8} \times 20 =$

MORE PRACTICE 359

Practice What You Have Learned

1. Add $2\frac{3}{4}$ to each of the numbers below.

a. 6 b. $4\frac{1}{4}$ c. $3\frac{7}{8}$ d. $3\frac{1}{3}$ e. $6\frac{2}{5}$ f. $6\frac{1}{6}$

2. Subtract $2\frac{5}{8}$ from each of the above numbers.

3. Multiply each of the above numbers by 3; by $\frac{1}{2}$; by $1\frac{1}{4}$.

4. Multiply \$3.60 by each of the numbers below.

a. 10 b. 100 c. 600 d. 705 e. $5\frac{3}{4}$

5. Divide each number below by 48; by 64.

a. 1296 b. 1728 c. 43,440 d. 8664 e. 19,856

How Large Should the Product Be?

Copy A and B. Write the products after the examples. Use your work to answer the problems below.

A.	B.
$6 \times 24 =$	$4 \times 2\frac{1}{2} =$
$2\frac{1}{2} \times 24 =$	$2\frac{1}{2} \times 2\frac{1}{2} =$
$1 \times 24 =$	$1 \times 2\frac{1}{2} =$
$\frac{1}{2} \times 24 =$	$\frac{1}{2} \times 2\frac{1}{2} =$
$\frac{1}{6} \times 24 =$	$\frac{1}{6} \times 2\frac{1}{2} =$

1. In which example in A is the product largest? In which is the product smallest?

2. In which examples in A are the products larger than 24, the number being multiplied? In which examples in A are the products smaller than 24?

3. When the multiplier is larger than 1, is the product larger or smaller than the number being multiplied?

4. The multiplier is smaller than 1. Is the product larger or smaller than the number being multiplied?

5. When the number is multiplied by 1, how does the product compare with the number being multiplied?

6. In which of the examples below will the products be greater than $\frac{3}{4}$? less than $\frac{3}{4}$? How do you know?

a. $\frac{1}{2} \times \frac{3}{4} =$ b. $2 \times \frac{3}{4} =$ c. $1\frac{1}{2} \times \frac{3}{4} =$ d. $\frac{5}{6} \times \frac{3}{4} =$

7. When the multiplier is larger than 1, the product is __?__ than the number being multiplied.

8. When the multiplier is smaller than 1, the product is __?__ than the number being multiplied.

In which of the examples below will the product be greater than the number being multiplied? less than the number being multiplied? Check by multiplying the numbers.

	a	b	c	d	e
9.	$1\frac{1}{2} \times 4\frac{1}{2} =$	$\frac{3}{4} \times 5\frac{1}{2} =$	$\frac{7}{8} \times \frac{4}{5} =$	$3\frac{5}{6} \times 9 =$	$\frac{1}{2} \times 1\frac{3}{4} =$
10.	$2 \times 3\frac{3}{4} =$	$1\frac{1}{4} \times \frac{3}{4} =$	$\frac{5}{6} \times 8 =$	$\frac{1}{4} \times \frac{5}{8} =$	$3\frac{3}{4} \times 5\frac{3}{5} =$
11.	$\frac{3}{4} \times \frac{4}{5} =$	$\frac{1}{4} \times 1\frac{1}{3} =$	$3\frac{1}{3} \times 3\frac{3}{10} =$	$\frac{9}{10} \times \frac{5}{6} =$	$4 \times \frac{7}{8} =$

What's Wrong Here?

These examples contain the kinds of errors boys and girls make most often in multiplication of fractions. Find the errors in each example. Then work it correctly.

1. $\frac{3}{4}\times 74=\frac{3\times 74}{2}=\frac{252}{2}=136$

2. $4\times\frac{2}{3}=\frac{4\times 2}{3}=\frac{8}{3}$

3. $\frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{8}}}\times\frac{\overset{3}{\cancel{6}}}{\underset{5}{\cancel{25}}}=\frac{4}{28}=\frac{1}{7}$

4. $\frac{1}{3}\times\frac{5}{6}=\frac{6}{18}=\frac{1}{3}$

5. $6\frac{2}{3}\times 3\frac{3}{4}=\frac{\overset{6}{\cancel{18}}}{\underset{1}{\cancel{3}}}\times\frac{\overset{5}{\cancel{15}}}{\underset{2}{\cancel{4}}}=30$

6. $\frac{3}{5}\times 5\frac{1}{4}=\frac{5}{\underset{3}{\cancel{3}}}\times\frac{\overset{8}{\cancel{21}}}{4}=\frac{40}{4}=10$

Find the Reasons for Errors You Make

If your work is incorrect, find the cause.

	a	b	c	d
1.	$\frac{3}{5}\times 2=$	$6\times\frac{1}{2}=$	$\frac{1}{2}\times 11=$	$8\times 3\frac{3}{4}=$
2.	$8\frac{1}{2}\times 7=$	$5\frac{1}{6}\times 5=$	$\frac{3}{4}\times\frac{3}{5}=$	$1\frac{1}{2}\times\frac{2}{3}=$
3.	$\frac{3}{8}\times 2\frac{1}{3}=$	$6\frac{2}{3}\times 3\frac{3}{4}=$	$2\frac{1}{2}\times 3\frac{1}{3}=$	$2\frac{2}{5}\times 6\frac{3}{4}=$
4.	$\frac{1}{3}\times 2\frac{5}{8}=$	$\frac{9}{10}\times\frac{15}{16}=$	$2\frac{2}{3}\times\frac{3}{4}=$	$\frac{5}{6}\times 4\frac{1}{2}=$

MORE PRACTICE 359

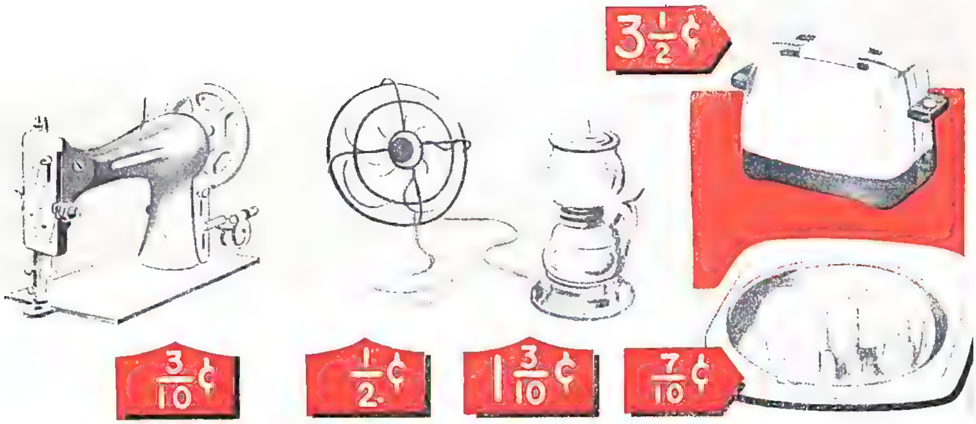
Practice What You Have Learned

I. Add each number in the lower line to each number in the upper line. Thus, add $1\frac{1}{4}$ to $3\frac{3}{4}$, then to 5, and so on.

A	B	C	D	E	F	G
$3\frac{3}{4}$	5	$7\frac{1}{2}$	$6\frac{3}{4}$	$2\frac{2}{3}$	$8\frac{1}{4}$	$4\frac{1}{6}$
1. $1\frac{1}{4}$	2. $1\frac{1}{2}$	3. $2\frac{1}{4}$	4. $\frac{3}{8}$	5. $1\frac{5}{6}$	6. $\frac{2}{3}$	7. $2\frac{3}{5}$

II. Subtract the lines of numbers in the same way.

III. Multiply the numbers in the same way.



The Cost of Electricity in the Home

1. Which of the appliances costs least to operate for 1 hour? Which is the most expensive to operate for 1 hour?

2. How much more does it cost to use a toaster for 1 hour than a dishwasher?

3. What is the cost of using a sewing machine for 2 hours? for $\frac{1}{2}$ hour? for $3\frac{1}{3}$ hours? for 45 minutes?

4. What is the cost of using a fan for $\frac{1}{4}$ hour? for 2 hours? for $4\frac{1}{2}$ hours? for 40 minutes?

5. A toaster is used on the average $\frac{1}{4}$ hour each day. Find the cost of the electricity used by the toaster in a week.

6. A percolator is used 25 minutes each day. Find the cost of the electricity used by the percolator in a week.

7. The cost of using a 50-watt bulb is $\frac{1}{4}$ cent an hour. A bulb like this was not turned off between 8:30 A.M. and 2:30 P.M. How much money was wasted?

8. Electricity is measured by the **kilowatt** hour. There are 1000 watts in a kilowatt. In how many hours does a 40-watt bulb use a kilowatt?

★ 9. Find out how to read an electric meter.

Diagnostic Test in Multiplication of Fractions and Mixed Numbers

	a	b	c	d	
1.	$\frac{1}{2} \times \frac{1}{4} =$	$\frac{1}{2} \times \frac{3}{4} =$	$\frac{3}{4} \times \frac{4}{15} =$	$\frac{2}{3} \times \frac{3}{4} =$	(208)
2.	$\frac{1}{2} \times 1\frac{1}{4} =$	$\frac{2}{3} \times 4\frac{1}{2} =$	$\frac{2}{5} \times 4\frac{1}{2} =$	$\frac{3}{4} \times 6\frac{2}{3} =$	(211)
3.	$1\frac{1}{4} \times \frac{1}{2} =$	$1\frac{2}{3} \times \frac{1}{10} =$	$1\frac{1}{2} \times \frac{2}{3} =$	$1\frac{7}{8} \times \frac{1}{5} =$	(211)
4.	$3\frac{1}{4} \times \frac{1}{2} =$	$7\frac{1}{2} \times 2\frac{3}{4} =$	$\frac{3}{4} \times 2\frac{2}{5} =$	$6\frac{1}{3} \times 2\frac{1}{4} =$	(215)
5.	$6 \times 3\frac{3}{4} =$	$8 \times 4\frac{2}{3} =$	$3\frac{5}{8} \times 21 =$	$6\frac{4}{5} \times 9 =$	(219)

For help, turn to the page at the right of the row.

Repeat the diagnostic test on page 204. Correct all errors.

★Making New Magic Squares

1. Prove that the square at the right is a magic square.

$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{5}{8}$	2
$1\frac{3}{4}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{4}$
$1\frac{7}{8}$	$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{3}{8}$
$\frac{1}{8}$	$1\frac{1}{2}$	1	$1\frac{5}{8}$

2. Draw a 4-inch square on your paper like the one at the right. Then, in each small square, write 2 times the number in the corresponding square in this magic square. See if the square you get is a magic square.

3. In the same way write $\frac{1}{2}$ times the number in each small square in a new square. Then see if you have a magic square. Try again, multiplying by 8.

4. See if adding $\frac{1}{2}$ to each number in the square above will make a new magic square.

5. See if subtracting $\frac{1}{8}$ from each number in the square above will make a new magic square. Try again, subtracting $\frac{1}{16}$.

Changing Recipes

The pictures show a standard set of measuring spoons and cups. The large cup holds $\frac{1}{2}$ pint. The set of small cups has $\frac{1}{4}$-, $\frac{1}{3}$-, and $\frac{1}{2}$-cup sizes. The sizes of the measuring spoons are 1 tablespoon, 1 teaspoon, $\frac{1}{2}$ teaspoon, and $\frac{1}{4}$ teaspoon.

The table at the right shows how these measures compare.

3 teaspoons (tsp.)	=	1 tablespoon (tbs.)
16 tablespoons	=	1 cup
2 cups	=	1 pint (pt.)

1. How many teaspoons are there in 1 cup? in $2\frac{1}{2}$ tablespoons?

2. How many tablespoons are there in 1 pint? in 6 teaspoons?

3. When the large cup above is half full, what part of a pint does it contain?

4. A pint of water weighs about 1 pound. How many ounces does 1 cup of water weigh? $\frac{3}{4}$ cup? $1\frac{1}{2}$ cups?

5. Below is given a recipe for 4 servings of hot chocolate. Make a recipe for 8 servings; for 12 servings.

$1\frac{1}{2}$ squares ($1\frac{1}{2}$ oz.) unsweetened chocolate	$2\frac{1}{2}$ tbs. sugar
	$2\frac{1}{4}$ cups milk
$\frac{3}{4}$ cup water	Few grains of salt

★6. Find half of the recipe for 14 biscuits given below:

2 cups flour	$\frac{1}{2}$ tsp. salt	$\frac{3}{4}$ cup milk
3 tsp. baking powder	$\frac{1}{4}$ cup shortening	

★7. Make a recipe for 21 biscuits.

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	4256	986	926.8	8.96	3 ft. 12 in.
	789	65	597.4	87.43	4 ft. 7 in.
	3927	8943	200.8	.59	3 ft. 6 in.
2.	$7\frac{1}{2}$	$8\frac{1}{4}$	$6\frac{7}{8}$	$7\frac{3}{4}$	3 lb. 6 oz.
	$6\frac{1}{2}$	$9\frac{3}{4}$	$4\frac{1}{2}$	$6\frac{1}{2}$	5 lb. $4\frac{1}{2}$ oz.
	$5\frac{1}{2}$	$7\frac{3}{4}$	$5\frac{1}{2}$	$5\frac{5}{8}$	7 lb. $7\frac{1}{2}$ oz.

Practice Test in Subtraction

1.	8004	9010	89.56	4.928	3 qt. $1\frac{1}{2}$ pt.
	2062	2765	27.69	3.178	1 qt. $1\frac{1}{2}$ pt.
2.	$7\frac{3}{4}$	$6\frac{1}{4}$	$9\frac{2}{3}$	6	4 min. 12 sec.
	$2\frac{5}{8}$	$1\frac{3}{4}$	$3\frac{1}{4}$	$2\frac{2}{3}$	2 min. 40 sec.

Practice Test in Multiplication

	a	b	c	d
1.	$30 \times 478 =$	$46 \times 984 =$	$368 \times 406 =$	$780 \times 890 =$
2.	$\frac{1}{2} \times \frac{3}{4} =$	$4 \times 2\frac{1}{2} =$	$2\frac{2}{3} \times 5\frac{1}{4} =$	$\frac{3}{4} \times 5\frac{5}{6} =$
3.	$8\frac{1}{4}$	9	3 ft. 6 in.	2 gal. 1 qt.
	7	$2\frac{1}{4}$	5	6

Practice Test in Division

1.	6)3915	8)64,752	7)63,056	9)87,572
2.	28)1084	46)1220	36)3305	75)47,578
3.	49)39,340	98)78,400	18)14,652	58)50,112

Checking on Important Points

1. Does dividing both terms of a fraction by the same number change the value of the fraction?

2. Does multiplying both terms of a fraction by the same number change the value of the fraction?

3. Why is the product of two proper fractions always less than 1?

4. Prove that the product of a proper fraction multiplied by a mixed number may be a proper fraction. Prove that it may be a whole number or a mixed number.

5. Use cancellation in multiplying $3\frac{3}{4}$ by $2\frac{2}{5}$.

6. Find $2 \times 4\frac{3}{4}$, using two different methods.

7. What difficulty is there in finding the quotient of the example $214 \div 29$?

8. Use the example to tell what number multiplied by 12 gives a product of 228.

9. What is the name of the place in which the 1 is written in the quotient?

$$\begin{array}{r} 12 \\ 19\overline{)228} \\ \underline{19} \\ 38 \\ \underline{38} \end{array}$$

10. Write in two ways: six and seven hundredths.

Using the Vocabulary of Arithmetic

Explain the meaning of each expression:

area	dotted half note	improper fraction
average	eighth note	measure (in music)
cancel	expensive	perimeter
decimal fraction	gauge	signature

Progress Test VI

1. $68\frac{1}{2} + 39\frac{3}{4}$ (100)

2. $85\frac{3}{4} + 92\frac{5}{6}$ (105)

3. $46\frac{1}{4} - 32\frac{3}{4}$ (95)

4. $5\frac{2}{3} - 3\frac{3}{4}$ (113)

5. $18¢ \times 2\frac{1}{2}$ (219)

6. $\frac{3}{4}$ of 6 = (197)

7. $4\frac{3}{4} \times 8$ (200)

8. $2\frac{1}{2} \times \frac{4}{5} =$ (215)

9. 846×200 (137)

10. $4\frac{2}{3} \times 3\frac{3}{4} =$ (215)

11. $6.8 + 2.5$ (162)

12. $9.87 + 4.36$ (164)

13. $8.756 - 2.485$ (180)

14. $84.0 - 16.7$ (166)

15. $\$95.60 \times 489$ (138)

16. $18\overline{)549}$ (66)

17. $27\overline{)21{,}168}$ (60)

18. $54\overline{)43{,}686}$ (31)

19. $\frac{3}{4}$ of \$.72 = (197)

20. $\frac{3}{4} \times 5\frac{3}{5} =$ (215)

For help, turn to the page given below the number of the example.

★Special Work to Do

If you have no work to correct, do the work below.

1. Show that the answer to $12 \div 4$ is the same as the answer to $12 \times \frac{1}{4}$.

2. Prove that $\frac{6}{4}$, $6 \div 4$, $4\overline{)6}$, and $\frac{1}{4}$ of 6 all have the same value.

3. Arrange the fractions $\frac{3}{8}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{2}{3}$, and $\frac{5}{6}$ in order of their value. Place the smallest fraction first.

4. How can you tell without multiplying that the product of $\frac{1}{2} \times 1\frac{5}{6}$ must be less than 1?

5. Why is the product of $\frac{1}{2} \times \frac{1}{4}$ smaller than either of the two fractions? Why must the product be less than 1?

6. Prove that the product of $2\frac{1}{2} \times 3\frac{2}{3}$ must be greater than 6 but less than 12.

Test in Problem Solving VI

1. How much more than $\frac{1}{2}$ hour is 45 minutes?

2. A class sold 248 tickets for the school play at 15 cents each. How much was received for the tickets?

3. One airplane flew at the rate of 6.7 miles a minute. Another flew at the rate of 8.1 miles a minute. How much greater was the speed of the second airplane?

4. Find the area of a room that is $12\frac{1}{2}$ feet long and 10 feet wide.

5. At \$1 a pound, how much does $\frac{3}{4}$ pound of ham cost?

6. At 4 for 25 cents, how many oranges can you buy for \$1.25?

7. Ann bought $\frac{1}{2}$ pound of butter at 80 cents a pound and 2 loaves of bread at 21 cents each. Find the total cost.

8. How much is saved by buying 4 pairs of 50-cent stockings at a $\frac{1}{5}$-off sale?

9. Each day Betty drinks $\frac{3}{4}$ quart of milk. How much more than 1 gallon is this a week?

10. What is the perimeter of a farm that is .75 mile long and .48 mile wide?

Did you beat your score on the last test?

CHAPTER VII

"Boy Merchants"

1. Vic has an evening newspaper route of 78 customers. He collects 25 cents a week from each customer. How much does he collect in one week if all his customers pay him?

2. He pays the newspaper company 18 cents a week for the papers for each customer. How much does he pay a week for the papers for his 78 customers?

3. How much does Vic have left from the money he collects each week after he pays for all the papers?

4. How much does Vic make on the papers he delivers to one customer during a week? At this rate, how much does he make on the papers he delivers to his 78 customers? Why should the answer you get be the same as the answer for problem 3?

5. Bob has a morning route of 60 customers. He makes $8\frac{1}{2}$ cents a week on the papers for each customer. Find the total amount he makes in 1 week; in 4 weeks.

6. Bob also sells Sunday morning papers at 15 cents each. He pays $11\frac{1}{2}$ cents for each paper. How much does he make if he sells 40 Sunday morning papers?

★7. Find out how the newsboys in your community buy and sell newspapers.

Are You Ready for Division of Fractions?

I. Express the following in simplest form.

1. $\frac{4}{4}$ $\quad \frac{2}{1}$ $\quad \frac{6}{1}$ $\quad \frac{16}{12}$ $\quad 7\frac{6}{8}$ $\quad 9\frac{10}{15}$

2. $4\frac{3}{2}$ $\quad 5\frac{6}{4}$ $\quad 2\frac{4}{4}$ $\quad 4\frac{4}{3}$

II. Change the following to improper fractions.

$3\frac{1}{4}$ $\quad 2\frac{2}{3}$ $\quad 5\frac{3}{4}$ $\quad 6\frac{7}{10}$ $\quad 4\frac{1}{2}$ $\quad 7\frac{1}{3}$

III. Show that the answers of each set are the same.

	a	b	c	d
1.	$6 \div 2 =$	$6 \times \frac{1}{2} =$	$\frac{1}{2}$ of $6 =$	$\frac{1}{2} \times 6 =$
2.	$3 \div 4 =$	$3 \times \frac{1}{4} =$	$\frac{1}{4}$ of $3 =$	$\frac{1}{4} \times 3 =$

IV. Be sure that you can multiply correctly with fractions.

	a	b	c	d
1.	$4 \times \frac{4}{3} =$	$1 \times \frac{3}{2} =$	$\frac{3}{4} \times \frac{2}{1} =$	$3\frac{1}{2} \times \frac{1}{4} =$
2.	$2\frac{1}{2} \times \frac{1}{4} =$	$\frac{1}{4} \times 2\frac{2}{3} =$	$3\frac{1}{2} \times 1\frac{1}{3} =$	$4\frac{1}{3} \times \frac{3}{2} =$
3.	$\frac{1}{3}$ of $\frac{1}{2} =$	$\frac{1}{4}$ of $2\frac{1}{2} =$	$\frac{3}{4}$ of $1\frac{1}{3} =$	$\frac{3}{4}$ of $4\frac{5}{6} =$

V. You must know how to check answers in division.

1. How do you check the answer to the division example at the right?

$$\begin{array}{r} 2\frac{1}{3} \\ 3\overline{)7} \\ \underline{6} \\ 1 \end{array}$$

2. Show that $9 \div 4 = 2\frac{1}{4}$. How do you check the answer?

3. How do you check the answer to $10 \div 12 = \frac{5}{6}$?

VI. In which examples below is the quotient sure to be 1? less than 1? greater than 1? How can you tell?
Divide to find the answers to see if you were right.

1. $34\overline{)90}$ $\quad$ 2. $25\overline{)25}$ $\quad$ 3. $24\overline{)12}$ $\quad$ 4. $18\overline{)30}$

Nancy Earns Money Too

Nancy received 40 cents an hour for helping a neighbor after school and on Saturdays. Below is her record for one week. Copy it. Fill in the missing numbers.

	The Time	Hours	Earnings
Monday	3:30 to 4:15	(1)?	(2)?
Tuesday	4:00 to 5:15	(3)?	(4)?
Wednesday	3:30 to 4:45	(5)?	(6)?
Thursday	3:45 to 5:15	(7)?	(8)?
Friday	3:30 to 5:15	(9)?	(10)?
Saturday	9:00 to 12:30	(11)?	(12)?
	Total	(13)?	(14)?

In what two ways can you find item (14)?

Practice What You Have Learned

	a	b	c	d	e
1.	$4\frac{1}{2}+6\frac{3}{4}=$	487×200	$.674 - .268$	$8\frac{1}{4}-6\frac{1}{2}=$	$3\frac{1}{2}\times 4=$
2.	$3.62 + 4.85$	$\frac{3}{4}\times 1\frac{1}{2}=$	$7\frac{2}{3}+6\frac{3}{5}=$	596×368	$26\overline{)52{,}104}$
3.	$8\frac{3}{5}\times 9=$	$9.7 - 8.9$	$38\overline{)3364}$	$6.74 - 2.89$	$7\frac{5}{6}-2\frac{7}{8}=$
4.	785×905	$4\frac{1}{2}\times 3\frac{1}{3}=$	$29\frac{1}{2} \times 8$	$63\overline{)4284}$	$24 \times 6\frac{3}{4}$

Picturing Division by a Fraction

1. In A you see a whole pie divided into fourths. How many fourths of a pie can you take out of a whole pie?

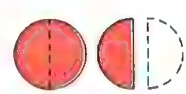
You can see that you can take 4 fourths out of a whole pie. This is the same as saying that $1 \div \frac{1}{4} = 4$. Show with your cut-outs that $1 \div \frac{1}{4} = 4$. You see that you can take $\frac{1}{4}$ out of 1 whole 4 times.

2. A pie is cut into eighths. How many times can $\frac{1}{8}$ pie be taken out of the whole pie? $1 \div \frac{1}{8} = ?$ Use your cut-outs to find $1 \div \frac{1}{8}$.

3. Use your cut-outs to show that $2 \div \frac{1}{4} = 8$. Show that $2 \div \frac{1}{2} = 4$.

4. How many times can $\frac{1}{4}$ pie be taken out of the $1\frac{1}{4}$ pies shown in B? $1\frac{1}{4} \div \frac{1}{4} = ?$ Show this with your cut-outs.

5. How many quarters are there in a dollar and a quarter ($\$1\frac{1}{4}$)?



6. Use the drawing at the right to find how much $1\frac{1}{2} \div \frac{1}{2}$ is. Show this also with your cut-outs.

7. Make a drawing or use your cut-outs to find how much $1\frac{3}{4} \div \frac{1}{4}$ is. How many quarters are there in a dollar and three quarters ($\$1\frac{3}{4}$)?

8. Use A above to find how many times $\frac{1}{4}$ of a pie can be taken out of $\frac{1}{2}$ pie. How much is $\frac{1}{2} \div \frac{1}{4}$? Show this also with your cut-outs. How many quarters are in a half dollar?

★9. Use your cut-outs to find how many times you can take $\frac{3}{4}$ out of $1\frac{1}{2}$. How much is $1\frac{1}{2} \div \frac{3}{4}$?

★10. Use your cut-outs to find the answer to $\frac{3}{4} \div \frac{1}{8}$.

Discovering Quotients in Division of Fractions

Use the picture of the ruler to find the answers to the examples in division by fractions below.

1. How many $\frac{1}{4}$ inches are there in 1 inch? We can express the problem like this: $1 \div \frac{1}{4} = ?$ How often can you subtract $\frac{1}{4}$ inch from 1 inch?

2. $2'' \div \frac{1}{4}'' =$	6. $\frac{3}{4}'' \div \frac{1}{4}'' =$	10. $1\frac{1}{2}'' \div 1\frac{1}{2}'' =$
3. $1'' \div \frac{1}{2}'' =$	7. $1\frac{1}{4}'' \div \frac{1}{4}'' =$	11. $1\frac{1}{2}'' \div \frac{1}{2}'' =$
4. $2'' \div \frac{1}{2}'' =$	8. $1\frac{3}{4}'' \div \frac{1}{4}'' =$	12. $1\frac{1}{2}'' \div \frac{1}{4}'' =$
5. $\frac{1}{2}'' \div \frac{1}{4}'' =$	9. $\frac{1}{4}'' \div \frac{1}{4}'' =$	13. $1\frac{1}{2}'' \div \frac{3}{4}'' =$

Finding How Many

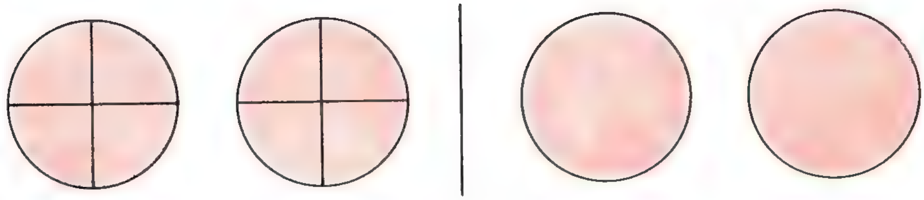
1. How many half apples are there in 3 whole apples? (See A.)

In 1 apple there are 2 half apples.
In 3 apples there are 3×2 half apples or 6 half apples.
You see that $3 \div \frac{1}{2} = 3 \times 2 = 6$.

2. How much is $2 \div \frac{1}{2}$? This means how many $\frac{1}{2}$'s in 2?

3. How many fourths are there in 2 whole pies? (See B.)
Think: In 1 pie there are 4 fourths.
In 2 pies there are 2×4 fourths or ? fourths.
This shows that $2 \div \frac{1}{4} = 2 \times 4 = 8$.

4. Mary's mother cut 2 whole pies into fifths. How many fifths are there in 2 whole pies? $2 \div \frac{1}{5} = ?$



How to Divide by a Fraction

1. How many fourths do you see in 1 whole? $1 \div \frac{1}{4} = ?$

2. How many times do you see $\frac{4}{4}$ above? $2 =$ how many fourths?

3. Let us find how many times we can take $\frac{1}{4}$ out of 2 wholes.

A. $2 \div \frac{1}{4} =$ B. $2 \times 4 = 8.$

We can take 8 fourths out of 2 wholes. $2 \div \frac{1}{4} = 8.$

Let us see how we can work this division example.

I. Write the number that is being divided: **2**

II. Compare the signs in A and B above. To what sign is the $\div$ in A changed in B? So write next: $\mathbf{2 \times}$

III. We know that 4 and $\frac{4}{1}$ are equal; so we can write the 4 in B above as $\frac{4}{1}$. $\mathbf{2 \times \frac{4}{1}}$

How is the $\frac{4}{1}$ in B different from the $\frac{1}{4}$ in A? **The terms of the fraction have changed places.**

IV. Write the $=$ sign and work the example: $\mathbf{2 \times \frac{4}{1} =}$

$$2 \times \frac{4}{1} = \frac{2 \times 4}{1} = \frac{8}{1} = 8$$

When the numerator and the denominator in a fraction change places, the fraction is **inverted.** The inverted form of $\frac{1}{4}$ is $\frac{4}{1}$, as shown in step **III** above.

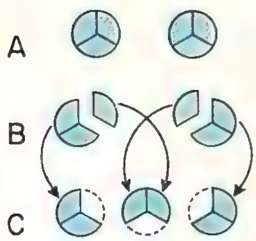
4. In what way are the two examples below alike? In what ways are they different?

A. $2 \div \frac{1}{4} =$ B. $2 \times \frac{4}{1} =$

5. Use the method in 3 to find $3 \div \frac{1}{4}$.

6. Bobby said, "A quick way to divide by a fraction is to change the $\div$ sign to the $\times$ sign. Then invert the fraction, and multiply." Show that Bobby was right.

Dividing by Other Fractions



1. The drawings picture the example $2 \div \frac{2}{3}$.

Use the drawings to find how many times $\frac{2}{3}$ of a whole can be taken out of two wholes.

Divide the two wholes into thirds. Take $\frac{2}{3}$ out of each whole. See B. How many thirds remain? How many $\frac{2}{3}$'s in 2 wholes? See C.

2. We can work the example $2 \div \frac{2}{3}$, using the method explained on page 234.

$$2 \div \frac{2}{3} =$$

$$2 \times \frac{3}{2} = \frac{2 \times 3}{2} = \frac{6}{2} = 3$$

In the work at the left, trace steps I, II, III, and IV, explained on page 234.

Because $\frac{2}{3}$ is less than 1, there are more than two $\frac{2}{3}$'s in 2. Therefore, 3 is a sensible answer.

To check the answer, think: $3 \times \frac{2}{3} = 2$. The 2 is the number being divided. So the work checks.

3. Explain the work below. Tell how to check the answers.

a. $3 \div \frac{3}{4} =$

$$3 \times \frac{4}{3} = \frac{3 \times 4}{3} = \frac{12}{3} = 4$$

b. $2 \div \frac{3}{4} =$

$$2 \times \frac{4}{3} = \frac{2 \times 4}{3} = \frac{8}{3} = 2\frac{2}{3}$$

4. What are the missing numbers in the example below? $6 \div \frac{3}{5} = 6 \times \frac{?}{3} = ?$ Complete the example and solve it.

Copy and divide. Check your answers.

	a	b	c	d
5.	$4 \div \frac{1}{2} =$	$3 \div \frac{1}{4} =$	$1 \div \frac{1}{3} =$	$2 \div \frac{1}{2} =$
6.	$3 \div \frac{3}{8} =$	$6 \div \frac{3}{4} =$	$6 \div \frac{2}{3} =$	$9 \div \frac{3}{4} =$
7.	$5 \div \frac{2}{3} =$	$7 \div \frac{3}{4} =$	$2 \div \frac{7}{8} =$	$4 \div \frac{3}{5} =$

8. Draw a line 6 inches long. Divide it into parts each $\frac{3}{4}$ inch long. How many parts are there in the line? Divide to find $6 \div \frac{3}{4}$. Are the two answers the same?

MORE PRACTICE 360

Dividing a Whole Number by a Mixed Number

1. Take a slip of paper 3 inches long. How many $1\frac{1}{2}$-inch pieces can you cut from the strip? $3 \div 1\frac{1}{2} = ?$

2. We can work the example $3 \div 1\frac{1}{2}$, as shown below.

$$3 \div 1\frac{1}{2} = 3 \div \frac{3}{2} =$$

$$3 \times \frac{2}{3} = \frac{3 \times 2}{3} = \frac{6}{3} = 2$$

First change $1\frac{1}{2}$ to $\frac{3}{2}$.
Then invert $\frac{3}{2}$ and multiply.
How do we get the $\frac{6}{3}$? the 2?
Check: $2 \times 1\frac{1}{2} = 3$.

3. Explain each step in the work below. Check the answers.

a. $4 \div 2\frac{1}{2} = 4 \div \frac{5}{2} =$

$$4 \times \frac{2}{5} = \frac{4 \times 2}{5} = \frac{8}{5} = 1\frac{3}{5}$$

b. $2 \div 3\frac{1}{3} = 2 \div \frac{10}{3} =$

$$2 \times \frac{3}{10} = \frac{2 \times 3}{10} = \frac{6}{10} = \frac{3}{5}$$

4. Why is the answer greater than 1 in example 3a? Why is the answer less than 1 in example 3b?

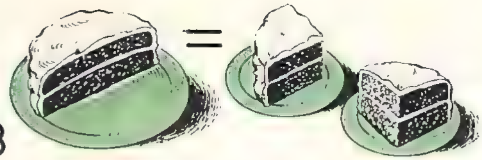
Tell in which examples below the quotient will be less than 1. Divide to see if your answers were right. Check.

	a	b	c	d
5.	$10 \div 3\frac{1}{3} =$	$5 \div 1\frac{2}{3} =$	$5 \div 1\frac{1}{4} =$	$8 \div 1\frac{3}{5} =$
6.	$6 \div 3\frac{1}{3} =$	$7 \div 2\frac{1}{2} =$	$4 \div 2\frac{2}{3} =$	$12 \div 2\frac{2}{5} =$
7.	$3 \div 4\frac{1}{2} =$	$4 \div 4\frac{1}{5} =$	$2 \div 3\frac{3}{4} =$	$1 \div 1\frac{7}{8} =$

MORE PRACTICE 360

Practice What You Have Learned

1.	$2 \div \frac{3}{4} =$	$10 \div 2\frac{1}{2} =$	$3 \div \frac{2}{3} =$	$10 \div 1\frac{1}{4} =$
2.	$4 \div 6\frac{2}{3} =$	$3 \div \frac{3}{4} =$	$4\frac{1}{2} - 2\frac{3}{4} =$	$7 \div \frac{3}{8} =$
3.	$\frac{2}{3}$ of $15 =$	$4\frac{1}{2} \times 3 =$	$6 \div 4\frac{1}{2} =$	$\frac{1}{2} \times 1\frac{2}{5} =$
4.	$2\frac{1}{2} \times 3\frac{1}{3} =$	$4 - \frac{4}{5} =$	$9\frac{3}{4} + 4\frac{7}{8} =$	$2 \div 1\frac{1}{3} =$

B 

Dividing a Fraction by a Fraction

1. What part of a whole cake is shown in A? How many fourths of a whole cake can be taken from the plate? $\frac{3}{4} \div \frac{1}{4} = ?$

2. How many fourths of a whole cake are there in the $\frac{1}{2}$ cake in B? How much is $\frac{1}{2} \div \frac{1}{4}$?

3. We can work the example $\frac{3}{4} \div \frac{1}{4}$, as shown below.

$$\frac{3}{4} \div \frac{1}{4} =$$

$$\frac{3}{4} \times \frac{4}{1} = \frac{3 \times 4}{4 \times 1} = \frac{12}{4} = 3$$

Invert the divisor, $\frac{1}{4}$.
Then multiply the two fractions.
Check: $3 \times \frac{1}{4} = \frac{3}{4}$.

4. Explain the work given below. Check the answers.

a. $\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2$

b. $\frac{2}{3} \div \frac{5}{6} = \frac{2}{\cancel{3}_{1}} \times \frac{\cancel{6}^{2}}{5} = \frac{4}{5}$

c. $\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$

d. $\frac{5}{6} \div \frac{5}{8} = \frac{\cancel{5}^{1}}{\cancel{6}_{3}} \times \frac{\cancel{8}^{4}}{\cancel{5}_{1}} = \frac{4}{3} = 1\frac{1}{3}$

Why are the answers in b and c less than 1? Why are they more than 1 in a and d?

To divide a fraction by another fraction, invert the divisor and multiply.

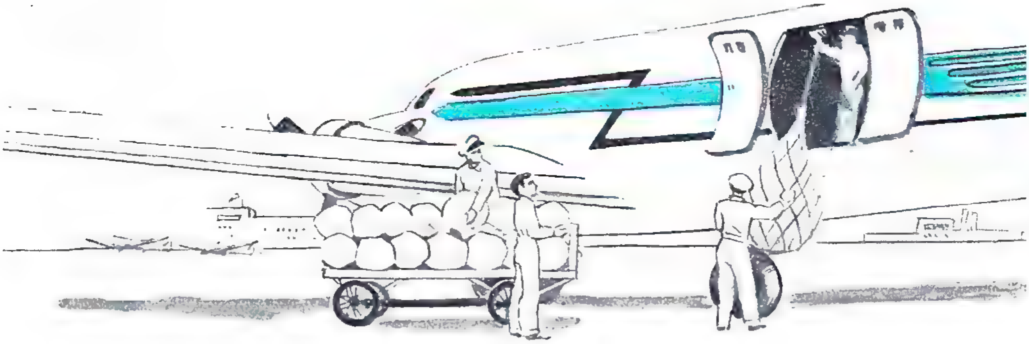
Divide. Check the answers you get.

	a	b	c	d	e
5.	$\frac{1}{2} \div \frac{1}{3} =$	$\frac{1}{2} \div \frac{1}{6} =$	$\frac{1}{2} \div \frac{3}{4} =$	$\frac{3}{4} \div \frac{1}{2} =$	$\frac{3}{5} \div \frac{9}{10} =$
6.	$\frac{4}{5} \div \frac{4}{9} =$	$\frac{8}{9} \div \frac{2}{3} =$	$\frac{7}{8} \div \frac{5}{6} =$	$\frac{3}{8} \div \frac{7}{8} =$	$\frac{1}{4} \div \frac{3}{4} =$

MORE PRACTICE 360

Practice What You Have Learned

1.	$3 \div \frac{1}{4} =$	$\frac{3}{4} \div \frac{3}{8} =$	$4 \div 2\frac{1}{2} =$	$\frac{3}{5} \div \frac{3}{10} =$	$\frac{7}{10} \div \frac{3}{5} =$
2.	$\frac{5}{8} \times 3\frac{1}{3} =$	$\frac{3}{4} \times \frac{3}{8} =$	$\frac{3}{4} + \frac{3}{8} =$	$\frac{3}{4} - \frac{3}{8} =$	$2\frac{1}{2} \times 3\frac{1}{3} =$



Speeding Up the Mail

1. In 1826 mail service between Boston and Washington was $7\frac{1}{2}$ days by stagecoach. How many hours was this?

2. Today mail is transported by rail from Boston to Washington in about 10 hours. How many times as long did it take by stagecoach in 1826 as by rail today?

3. By airplane, mail is carried today from Boston to Washington in about $3\frac{1}{3}$ hours. How many times as many hours does it take by rail as by airplane?

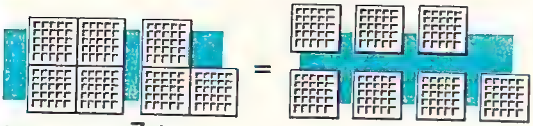
4. The distance by automobile between Boston and Washington is about 450 miles. How many miles a day would a stagecoach average if it traveled this distance in $7\frac{1}{2}$ days?

5. Suppose 450 miles is the distance by rail or airplane from Boston to Washington. How many miles an hour does mail go on the average today by rail? by airplane?

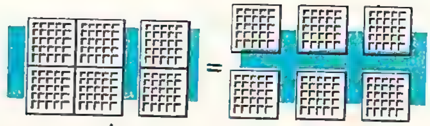
6. A fast ocean liner takes about $5\frac{1}{2}$ days to go from New York to England. An airplane carrying mail makes the distance in about 15 hours. How many times as long does it take by ocean liner as it takes by airplane?

7. The Pony Express charged \$2.50 a half ounce for carrying a letter. What was the charge for a $1\frac{1}{2}$-ounce letter?

★ 8. What is the cost today of different ways of mailing a $1\frac{1}{2}$-ounce letter?



A $1\frac{3}{4} = \frac{?}{4}$



B $1\frac{1}{2} = \frac{?}{4}$

Dividing a Mixed Number by a Fraction

1. A shows $1\frac{3}{4}$ waffles. Into how many fourths of a waffle can the $1\frac{3}{4}$ waffles be divided? How much is $1\frac{3}{4} \div \frac{1}{4}$?

2. How many fourths of a waffle are there in $1\frac{1}{2}$ waffles? Use B to find the answer. $1\frac{1}{2} \div \frac{1}{4} = ?$

3. We can find the answer to $1\frac{3}{4} \div \frac{1}{4}$ as shown below.

$$1\frac{3}{4} \div \frac{1}{4} = \frac{7}{4} \div \frac{1}{4} =$$

$$\frac{7}{4} \times \frac{4}{1} = \frac{28}{4} = 7$$

First change $1\frac{3}{4}$ to $\frac{7}{4}$. How?

Then invert the divisor, $\frac{1}{4}$, and multiply as shown at the left.

Why must the answer be greater than $1\frac{3}{4}$?

4. Explain each step in the work below.

a. $1\frac{1}{2} \div \frac{1}{4} = \frac{3}{2} \div \frac{1}{4} =$

$\frac{3}{2} \times \frac{4}{1} = \frac{12}{2} = 6$

b. $3\frac{1}{2} \div \frac{5}{6} = \frac{7}{2} \div \frac{5}{6} =$

$\frac{7}{2} \times \frac{6}{5} = \frac{42}{10} = 4\frac{2}{10} = 4\frac{1}{5}$

Divide and check:

	a	b	c	d
5.	$4\frac{1}{2} \div \frac{1}{2} =$	$3\frac{3}{4} \div \frac{1}{4} =$	$1\frac{3}{4} \div \frac{3}{8} =$	$2\frac{1}{4} \div \frac{5}{8} =$
6.	$5\frac{1}{3} \div \frac{2}{3} =$	$2\frac{1}{2} \div \frac{1}{5} =$	$2\frac{5}{6} \div \frac{3}{4} =$	$5\frac{1}{4} \div \frac{7}{12} =$

7. How much is $4\frac{1}{2} \div 1\frac{1}{4}$?

$$4\frac{1}{2} \div 1\frac{1}{4} = \frac{9}{2} \div \frac{5}{4} =$$

$$\frac{9}{2} \times \frac{4}{5} = \frac{36}{10} = 3\frac{6}{10} = 3\frac{3}{5}$$

First change the mixed numbers to improper fractions. Then invert the divisor, $\frac{5}{4}$, and multiply.

Why is the quotient greater than 1?

Tell in which examples below the answer will be less than 1. Then divide. Check your answers.

	a	b	c	d
8.	$7\frac{1}{2} \div 1\frac{1}{2} =$	$3\frac{2}{3} \div 2\frac{1}{2} =$	$3\frac{1}{3} \div 6\frac{2}{3} =$	$1\frac{1}{4} \div 2\frac{1}{2} =$
9.	$3\frac{1}{2} \div 1\frac{3}{4} =$	$1\frac{1}{4} \div 8\frac{3}{4} =$	$3\frac{3}{8} \div 3\frac{3}{8} =$	$7\frac{1}{2} \div 2\frac{1}{2} =$
10.	$5\frac{1}{4} \div \frac{3}{4} =$	$\frac{3}{4} \div \frac{6}{7} =$	$6 \div 1\frac{2}{3} =$	$4\frac{1}{2} \div 13\frac{1}{2} =$

MORE PRACTICE 361

"Watch the Pennies"

1. At a grocery store, sugar was sold for 90¢ in 10-pound bags. When sold in small amounts, sugar cost 11¢ a pound. How much less did sugar cost a pound in 10-pound bags than when sold by the pound?

2. Corn was sold for 12¢ a can or 3 cans for 34¢. How much would be saved by buying 3 cans at a time instead of 3 single cans?

3. A 1-pound jar of honey cost 33¢. A 5-pound pail of honey cost $.96. How much less did a 5-pound pail of honey cost than five 1-pound jars?

4. A pint jar of pickles cost 24¢. A quart jar cost 38¢. How much more did a quart of pickles cost in pint jars than in a quart jar?

5. Nuts were sold at 30¢ for 4 ounces or 55¢ for 8 ounces. How much more would two 4-ounce bags of nuts cost than one 8-ounce bag?

6. At a $\frac{1}{4}$-off sale Tommy bought a football that sold regularly for $7.00. How much did he save by buying the football at the sale?

7. At a sale Mary bought 3 handkerchiefs for 45¢. The regular price was 25¢ each. How much did Mary save by buying the three handkerchiefs at the sale?

★8. Find other ways in which people can save money by thrifty buying.

Dividing Fractions by Mixed Numbers

1. The $2\frac{1}{2}$ cups of flour needed for a cake weigh $\frac{5}{8}$ pound. How much does 1 cup of flour weigh?

$\frac{5}{8} \div 2\frac{1}{2} =$

$$\frac{5}{8} \div \frac{5}{2} = \frac{5}{8} \times \frac{2}{5} = \frac{10}{40} = \frac{1}{4}$$

Think: $\frac{5}{8}$ lb. $\div\ 2\frac{1}{2} = ?$

Change $2\frac{1}{2}$ to $\frac{5}{2}$. Invert the $\frac{5}{2}$ and multiply as in multiplying by any fraction.

A cup of flour weighs $\frac{1}{4}$ pound. Why must the answer be less than $\frac{5}{8}$ pound?

2. The $1\frac{1}{2}$ cups of sugar for frosting the cake weigh $\frac{3}{4}$ pound. How much does 1 cup of sugar weigh? Think: $\frac{3}{4}$ lb. $\div\ 1\frac{1}{2} = ?$ Why must the answer be less than $\frac{3}{4}$ lb.?

Find and check the answers to the following examples:

3. $\frac{1}{2} \div 1\frac{1}{3} =$	4. $\frac{3}{4} \div 2\frac{7}{8} =$	5. $\frac{2}{3} \div 3\frac{5}{6} =$	6. $\frac{4}{5} \div 1\frac{1}{10} =$
7. $\frac{5}{6} \div 1\frac{2}{3} =$	8. $\frac{7}{8} \div 2\frac{1}{4} =$	9. $\frac{1}{2} \div 3\frac{9}{10} =$	10. $\frac{3}{10} \div 2\frac{1}{10} =$

MORE PRACTICE 361

How Can You Tell?

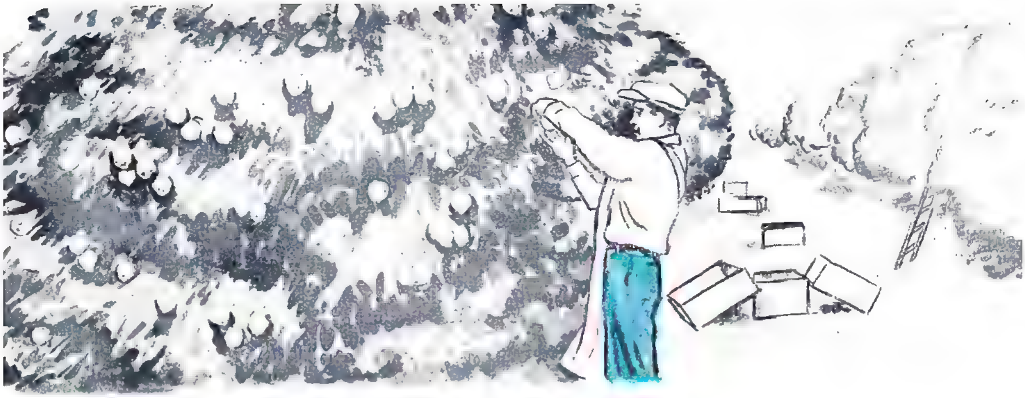
In which examples below will the answer be equal to 1? less than 1? greater than 1? Explain why.

1. $\frac{1}{2} \div \frac{1}{2} =$	5. $\frac{1}{2} \times \frac{1}{4} =$	9. $3\frac{1}{4} \div 2\frac{1}{2} =$
2. $\frac{1}{4} \div \frac{1}{2} =$	6. $\frac{1}{4} \times 3\frac{1}{2} =$	10. $2\frac{1}{2} \div 4\frac{1}{4} =$
3. $\frac{1}{2} \div \frac{1}{4} =$	7. $\frac{3}{4} \times 4\frac{2}{3} =$	11. $2\frac{1}{4} \div 2\frac{1}{4} =$
4. $3\frac{1}{3} \div 2\frac{1}{2} =$	8. $\frac{1}{2} \times \frac{2}{3} =$	12. $\frac{5}{6} \times \frac{8}{9} =$

Using What You Have Learned

1. At $2\frac{1}{2}$ cents each, how many apples can you buy for 5 cents? for 10 cents? for 25 cents? for 50 cents? for \$1.50?

2. How many boards $1\frac{1}{2}$ feet long can be cut from a board 3 feet long? $4\frac{1}{2}$ feet long? 9 feet long? $13\frac{1}{2}$ feet long?



Liquid Sunshine

1. Toby owns a small orange grove of 70 trees. It is about one acre in size. A tree produces about 600 oranges. At that rate, how many oranges are produced by the 70 trees?

2. A good crop of oranges is 600 70-lb. boxes to the acre. How many pounds of oranges is that?

3. Find the value of 600 boxes of oranges at $1.70 each.

4. Oranges are not all of the same size. Boxes of large oranges sometimes contain 108 oranges. How many dozen is that?

5. Boxes of small oranges sometimes contain 228 oranges. How many dozen is that?

6. Many oranges are used to prepare canned orange juice. About $\frac{1}{2}$ dozen medium-sized oranges are needed to make one pint of orange juice. How many oranges are needed to make a quart of orange juice?

7. A large can of orange juice costing 36 cents contains enough juice for 8 glassfuls. How much does one glassful of orange juice cost?

8. At the grocery store, oranges are often sold by the pound. Counting 4 oranges to the pound, how much do a dozen oranges cost at 14 cents a pound?

★ 9. Why is it a good plan to sell oranges by the pound?

What's Wrong Here?

These examples contain the kinds of errors most often made in division of fractions. Find the errors in each example. Then copy and work the example correctly.

1. $1\frac{3}{4} \div 1\frac{1}{2} =$

$$\frac{7}{4} \times \frac{3}{2} = \frac{21}{8} = 2\frac{3}{8}$$

2. $4\frac{1}{2} \div \frac{6}{7} =$

$$\frac{\overset{3}{\cancel{9}}}{3} \times \frac{7}{\underset{2}{\cancel{6}}} = \frac{21}{2} = 10\frac{1}{2}$$

3. $\frac{3}{4} \div \frac{1}{2} =$

$$\frac{4}{3} \times \frac{1}{2} = \frac{4}{6}$$

4. $8 \div 1\frac{1}{5} =$

$$\overset{4}{\cancel{8}} \times \frac{5}{\underset{3}{\cancel{6}}} = \frac{20}{3}$$

Practice in Division of Fractions

MORE PRACTICE 362

Work these examples. Try not to make any of the errors you found in the examples above.

	a	b	c	d
1.	$\frac{1}{2} \div \frac{3}{4} =$	$8 \div \frac{1}{3} =$	$\frac{1}{2} \div \frac{1}{3} =$	$\frac{1}{3} \div \frac{1}{3} =$
2.	$9 \div \frac{6}{7} =$	$6 \div 2\frac{1}{2} =$	$\frac{1}{3} \div \frac{1}{6} =$	$\frac{3}{8} \div \frac{9}{10} =$
3.	$5 \div 6\frac{2}{3} =$	$\frac{7}{8} \div \frac{5}{9} =$	$2\frac{1}{4} \div \frac{1}{3} =$	$\frac{7}{8} \div 5\frac{5}{6} =$
4.	$\frac{3}{4} \div 1\frac{1}{2} =$	$6\frac{2}{3} \div 1\frac{2}{3} =$	$8 \div 10\frac{2}{5} =$	$\frac{1}{8} \div 1\frac{1}{5} =$
5.	$5\frac{2}{3} \div 1\frac{1}{6} =$	$\frac{2}{3} \div 2\frac{1}{4} =$	$1\frac{1}{2} \div \frac{1}{2} =$	$7 \div 1\frac{3}{4} =$

Practice What You Have Learned

1.	$\frac{1}{2} + \frac{1}{4} =$	$7\frac{1}{2} \div 2\frac{1}{2} =$	$3\frac{3}{4} + 2\frac{7}{8} =$	$6 \times 3\frac{1}{4} =$
2.	$\frac{2}{3} \div \frac{3}{4} =$	$6\frac{3}{4} + 2\frac{5}{6} =$	$5\frac{1}{2} \times \frac{2}{5} =$	$\frac{4}{5} \div 1\frac{1}{5} =$
3.	$7\frac{1}{2} - \frac{3}{4} =$	$5\frac{1}{4} \times 4\frac{2}{3} =$	$\frac{3}{4} \div \frac{3}{8} =$	$7\frac{1}{2} \times 9 =$
4.	$8\frac{1}{4} + 7\frac{2}{3} =$	$\frac{5}{6} \div \frac{2}{3} =$	$4\frac{1}{2} \div 2\frac{1}{4} =$	$6\frac{1}{4} - 3\frac{2}{3} =$
5.	$6 \div 1\frac{1}{4} =$	$\frac{3}{4} \times 7\frac{2}{3} =$	$2 \div 3\frac{1}{3} =$	$9\frac{3}{5} \div 2\frac{1}{10} =$
6.	$\begin{array}{r} 8 \\ \times 2\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 408 \\ \times 39 \\ \hline \end{array}$	$\begin{array}{r} 26.84 \\ -15.78 \\ \hline \end{array}$	$39\overline{)31{,}434}$
7.	$\begin{array}{r} 96.75 \\ +87.56 \\ \hline \end{array}$	$\begin{array}{r} 49.685 \\ +87.964 \\ \hline \end{array}$	$\begin{array}{r} 7.596 \\ -2.687 \\ \hline \end{array}$	$57\overline{)50{,}734}$

Diagnostic Test in Division of Fractions

	a	b	c	d	
1.	$1 \div \frac{1}{4} =$	$2 \div \frac{1}{2} =$	$3 \div \frac{4}{5} =$	$6 \div \frac{3}{8} =$	(235)
2.	$6 \div 1\frac{1}{2} =$	$5 \div 1\frac{2}{3} =$	$4 \div 2\frac{2}{5} =$	$9 \div 2\frac{3}{4} =$	(236)
3.	$3 \div 4\frac{1}{2} =$	$4 \div 8\frac{1}{2} =$	$4 \div 6\frac{2}{3} =$	$7 \div 9\frac{4}{5} =$	(236)
4.	$\frac{3}{4} \div \frac{1}{2} =$	$\frac{2}{3} \div \frac{1}{3} =$	$\frac{3}{4} \div \frac{3}{4} =$	$\frac{3}{4} \div \frac{5}{8} =$	(237)
5.	$\frac{1}{2} \div \frac{3}{4} =$	$\frac{1}{8} \div \frac{1}{4} =$	$\frac{2}{3} \div \frac{5}{6} =$	$\frac{3}{4} \div \frac{7}{8} =$	(237)
6.	$1\frac{1}{2} \div \frac{1}{8} =$	$1\frac{3}{4} \div \frac{1}{4} =$	$7\frac{1}{2} \div \frac{5}{6} =$	$4\frac{2}{3} \div \frac{7}{8} =$	(239)
7.	$2\frac{1}{8} \div 1\frac{1}{2} =$	$4\frac{1}{2} \div 2\frac{1}{4} =$	$3\frac{1}{2} \div 3\frac{1}{2} =$	$1\frac{3}{4} \div 4\frac{3}{8} =$	(239)
8.	$\frac{1}{2} \div 1\frac{1}{2} =$	$\frac{3}{4} \div 2\frac{1}{4} =$	$\frac{4}{5} \div 3\frac{1}{10} =$	$\frac{2}{3} \div 4\frac{1}{2} =$	(241)

Turn for help to the page given at the right.

★Special Work to Do

1. Show that $\frac{4}{3}$, $3\overline{)4}$, $4 \div 3$, and $\frac{1}{3}$ of 4 all have the same value.

2. Write in the above four ways: seven divided by four.

3. Show that dividing 20 by 4 is the same as finding $\frac{1}{4}$ of 20 or $20 \times \frac{1}{4}$.

4. Show that to divide by 2 is the same as to multiply by $\frac{1}{2}$.

5. What is the quotient of $8\overline{)64}$? Multiply both parts of the example by 5; then divide the numbers you get. Is the quotient changed?

6. What is the quotient of $40\overline{)160}$? Divide both parts of the example by 10; then divide. Is the quotient changed?

7. Write an example in division of fractions in which the quotient is a fraction; a mixed number; a whole number.

★Just for Fun

1. How do we change $\frac{2}{3}$ to $\frac{4}{6}$? How do we change $\frac{4}{6}$ to $\frac{2}{3}$? When we multiply or divide both terms of a fraction by the same number, its value is not changed.

2. Find the answer to $\frac{8}{9} \div \frac{2}{3}$ in the usual way.

$$\frac{8}{9} \div \frac{2}{3} = \frac{8}{9} \times \frac{3}{2} = \frac{24}{18} = 1\tfrac{6}{18} = 1\tfrac{1}{3}$$

3. What is the answer when we divide the two numerators and the two denominators in problem 2 as shown below?

$$\frac{8}{9} \div \frac{2}{3} = \frac{8 \div 2}{9 \div 3} = \frac{4}{3} = 1\tfrac{1}{3}$$

The answer we get is the same as the answer we found by inverting and multiplying as in problem 2.

4. Use the two methods shown in 2 and 3 to find the answers to the following examples:

a. $\frac{6}{8} \div \frac{2}{4} =$ b. $\frac{3}{4} \div \frac{1}{4} =$ c. $4\frac{1}{2} \div 1\frac{1}{2} =$

5. Find the answer to $\frac{3}{4} \div \frac{1}{8}$ as in problem 2. Can you also use the method shown in problem 3 to find the answer?

6. Change $\frac{3}{4}$ to $\frac{6}{8}$; then divide $\frac{6}{8}$ by $\frac{1}{8}$ as in problem 3. Is the answer the same as in problem 5?

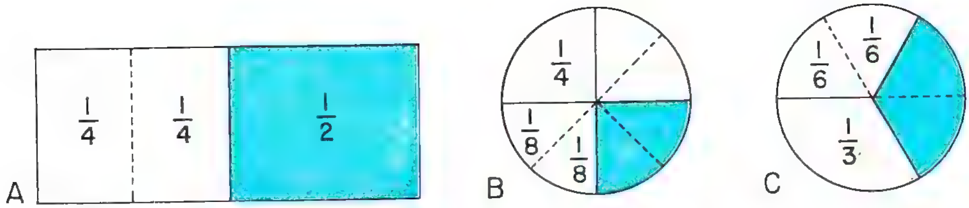
7. Show that the quotient of $\frac{3}{4} \div \frac{1}{4}$, two like fractions, is what we get by dividing the two numerators, $3 \div 1$.

8. Why can you not use the method shown in problem 3 to find the quotient of $\frac{3}{4} \div \frac{2}{3}$?

9. Change both $\frac{3}{4}$ and $\frac{2}{3}$ to twelfths. Divide the two numerators. What is the answer if you divide $\frac{3}{4}$ by $\frac{2}{3}$ by inverting the divisor and multiplying? Which method seems easier?

10. Use the two methods to find the answers below.

a. $\frac{2}{3} \div \frac{1}{6} =$ b. $\frac{3}{4} \div \frac{3}{5} =$ c. $\frac{5}{6} \div \frac{3}{4} =$ d. $\frac{2}{3} \div \frac{3}{4} =$



Dividing Fractions into Equal Parts

1. In which drawing above is $\frac{1}{2}$ divided into two equal parts? How large is each of the two parts?

We can say that $\frac{1}{2} \div 2 = \frac{1}{4}$. This example means that $\frac{1}{2}$ is divided into two equal parts, each equal to $\frac{1}{4}$. See A.

2. Which drawing shows that $\frac{1}{3} \div 2 = \frac{1}{6}$?
3. Which drawing shows that $\frac{1}{4} \div 2 = \frac{1}{8}$?

How to Divide a Fraction by a Whole Number

If we divide $\frac{1}{4}$ into two equal parts ($\frac{1}{4} \div 2$), each part is equal to $\frac{1}{8}$. B shows this.

1. Let us see how to work the example $\frac{1}{4} \div 2$.

$$\frac{1}{4} \div 2 = \frac{1}{4} \div \frac{2}{1} =$$

$$\frac{1}{4} \times \frac{1}{2} = \frac{1 \times 1}{4 \times 2} = \frac{1}{8}$$

Think of 2 as $\frac{2}{1}$, or two ones.

Change $\div$ to $\times$. Invert $\frac{2}{1}$. This gives us $\times \frac{1}{2}$. Multiply as in multiplying fractions. Check: $2 \times \frac{1}{8} = \frac{1}{4}$.

Why must the answer be less than $\frac{1}{4}$?

2. Explain the work below. Check the answers.

a. $\frac{3}{4} \div 2 = \frac{3}{4} \div \frac{2}{1} =$

$\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$

b. $\frac{2}{3} \div 2 = \frac{2}{3} \div \frac{2}{1} =$

$\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} = \frac{1}{3}$

Why is each answer less than the number being divided?

To divide a fraction by a whole number, invert the whole number. Then multiply.

Divide. Check your answers.

	a	b	c	d
3.	$\frac{1}{3} \div \frac{2}{1} =$	$\frac{2}{3} \div \frac{2}{1} =$	$\frac{1}{2} \div \frac{2}{1} =$	$\frac{2}{3} \div \frac{3}{1} =$
4.	$\frac{2}{3} \div 4 =$	$\frac{3}{4} \div 3 =$	$\frac{4}{5} \div 2 =$	$\frac{5}{6} \div 5 =$

Quick Thinking in Arithmetic

1. In which of the examples below will the answer be less than 1? greater than 1? How can you tell?

a. $\frac{3}{4} \times \frac{5}{6} =$ b. $\frac{1}{4} \times 3\frac{1}{2} =$ c. $\frac{2}{3} \times 6 =$ d. $\frac{1}{2}$ of $\frac{7}{8} =$

2. Why can the product of two proper fractions never be equal to 1 or more than 1?

3. In which of the examples below will the answer be less than 1? equal to 1? greater than 1? Explain your answer.

a. $2\frac{1}{2} \div 7\frac{1}{2} =$ b. $\frac{7}{8} \div 2 =$ c. $6\frac{2}{3} \div 4\frac{1}{5} =$ d. $\frac{3}{4} \div \frac{3}{4} =$

4. In examples in the division of whole numbers when is the quotient less than 1? equal to 1? greater than 1?

5. What part of a pound is 10 ounces?

6. Explain how we change the fraction $\frac{5}{10}$ to $\frac{1}{2}$; to $\frac{50}{100}$.

7. How can you tell that the difference between $5\frac{3}{4}$ and $4\frac{1}{2}$ will be greater than 1? that it will be less than 2?

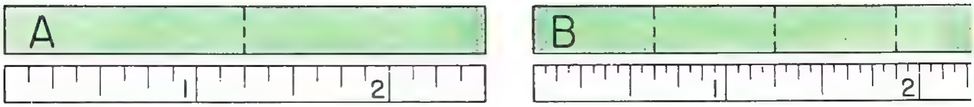
Practice What You Have Learned

Set I

	a	b	c	d
1.	$\frac{1}{4} \div 3 =$	$\frac{3}{4} \times \frac{2}{3} =$	$5 \div \frac{2}{3} =$	$\frac{5}{6} \div 2 =$
2.	$3 \times \frac{2}{5} =$	$\frac{3}{4} \div \frac{3}{5} =$	$\frac{1}{4} \times 3 =$	$4 \div 2\frac{2}{3} =$
3.	$\frac{3}{8} \div 3 =$	$6 \times 7\frac{1}{6} =$	$3 \div 4\frac{1}{3} =$	$3\frac{3}{4} + 6\frac{1}{2} =$
4.	$\frac{5}{6} \div \frac{7}{8} =$	$4\frac{3}{4} + 5\frac{1}{2} =$	$8 \times \frac{1}{2} =$	$7\frac{1}{2} - 6\frac{7}{8} =$

Set II

1.	$4\frac{2}{3} - \frac{2}{3} =$	$\frac{7}{8} \div 1\frac{3}{4} =$	$8\frac{4}{5} + 2\frac{7}{10} =$	$3\frac{2}{3} \div 2\frac{1}{2} =$
2.	$4\frac{2}{3} \div \frac{5}{6} =$	$\frac{1}{3} \times 3\frac{3}{4} =$	$\frac{1}{2} \div 2 =$	$2\frac{3}{4} + 4\frac{5}{6} =$
3.	$\frac{8}{9} \div 4 =$	$6\frac{1}{3} - 2\frac{3}{4} =$	$4\frac{4}{5} \div 6\frac{1}{5} =$	$7 - 3\frac{2}{5} =$
4.	$2\frac{2}{3} \times \frac{1}{8} =$	$\frac{2}{3} \div 4 =$	$8\frac{1}{2} - 6\frac{2}{3} =$	$3\frac{1}{3} \times 2\frac{5}{8} =$



Dividing Mixed Numbers by Whole Numbers

1. Take a slip of paper $2\frac{1}{2}$ inches long. Fold it into two equal parts, as shown in A. Measure the length of each of the two parts of your slip of paper. How much is $2\frac{1}{2}'' \div 2$? Check with the picture above.

2. Fold the slip into four equal parts, as shown in B. Measure the length of each of the four parts of your slip of paper. How much is $2\frac{1}{2}'' \div 4$? How much is $1\frac{1}{4}'' \div 2$?

You have just found the answers to three examples: $2\frac{1}{2} \div 2$, $2\frac{1}{2} \div 4$, and $1\frac{1}{4} \div 2$. Let us see how to work the examples.

3. How much is $2\frac{1}{2} \div 2$?

$$2\frac{1}{2} \div 2 = \frac{5}{2} \div \frac{2}{1} =$$

$$\frac{5}{2} \times \frac{1}{2} = \frac{5 \times 1}{2 \times 2} = \frac{5}{4} = 1\frac{1}{4}$$

Change $2\frac{1}{2}$ to $\frac{5}{2}$. Think of 2 as $\frac{2}{1}$.

Change $\div$ to $\times$. Then invert $\frac{2}{1}$, and multiply.

To check, find $2 \times 1\frac{1}{4}$.

Why must the quotient be greater than 1?

4. Explain each step in the work below. Check.

a. $2\frac{1}{2} \div 4 =$

$$\frac{5}{2} \div \frac{4}{1} = \frac{5}{2} \times \frac{1}{4} = \frac{5}{8}$$

b. $1\frac{1}{4} \div 2 =$

$$\frac{5}{4} \div \frac{2}{1} = \frac{5}{4} \times \frac{1}{2} = \frac{5}{8}$$

Why must these quotients be less than 1?

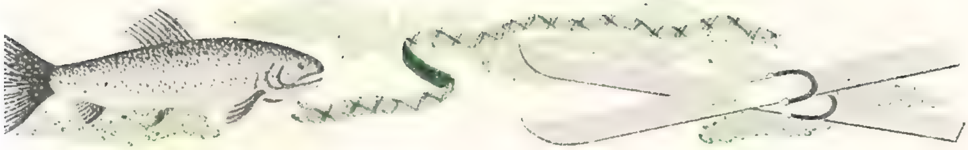
5. What are the missing numbers in the example below?

$$4\frac{1}{2} \div 3 = \frac{?}{2} \div \frac{3}{1} = \frac{?}{2} \times \frac{?}{?} = ?$$

MORE PRACTICE 362

Divide and check the answers:

	a	b	c	d
6.	$6\frac{1}{2} \div 4 =$	$3\frac{1}{2} \div 2 =$	$7\frac{1}{2} \div 5 =$	$4\frac{1}{2} \div 3 =$
7.	$2\frac{1}{2} \div 5 =$	$3\frac{1}{4} \div 14 =$	$3\frac{2}{3} \div 6 =$	$7\frac{1}{2} \div 10 =$
8.	$9\frac{1}{3} \div 7 =$	$6\frac{3}{10} \div 9 =$	$5\frac{5}{6} \div 5 =$	$5\frac{5}{8} \div 3 =$



How Boys and Girls Use Fractions

1. Bobby's problem: "I caught 5 fish. Their total weight was $7\frac{1}{2}$ pounds. What was their average weight?"

2. Betty's problem: "I have a ribbon $7\frac{1}{2}$ yards long. How many pieces $1\frac{1}{2}$ yards long can I cut from the ribbon?"

3. Dick's problem: "How much would I pay for $4\frac{1}{2}$ pounds of butter at 93 cents a pound?"

4. Carlota's problem: "On a trip last summer we drove 110 miles in $2\frac{1}{2}$ hours. How many miles did we average an hour?"

5. Patty's problem: "How much do I earn in 1 hour and 45 minutes if I am paid 40 cents an hour?"

6. Keith's problem: "I bought a pair of \$15 skis at a $\frac{1}{4}$-off sale. How much did I pay for them?"

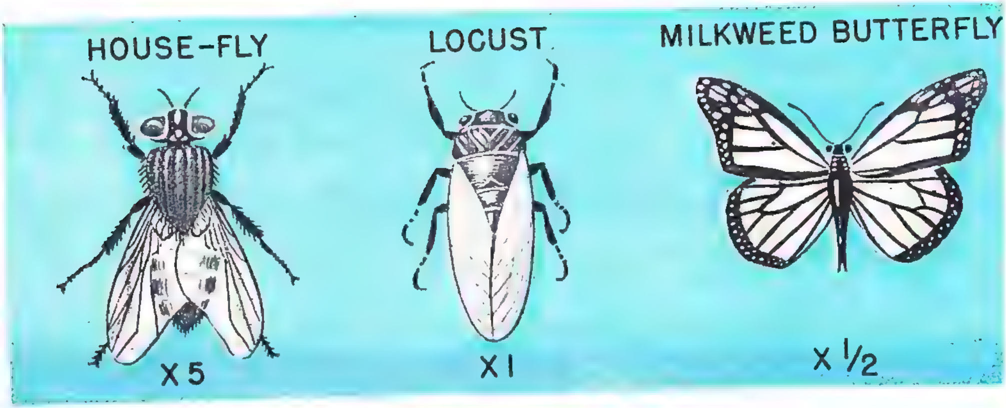
7. John's problem: "Our farm is $\frac{3}{4}$ mile long and $\frac{1}{2}$ mile wide. What is the area of our farm?"

8. Ann's problem: "Find the cost of cloth for 6 towels at 50 cents a yard if I need $1\frac{1}{4}$ yards for each towel."

9. Tom's problem: "I can run 50 yards in $6\frac{1}{5}$ seconds. At that rate, how long would it take me to run 100 yards?"

Practice What You Have Learned

	a	b	c	d
1.	$\frac{3}{4} \div 2 =$	$\frac{4}{5} \times \frac{7}{8} =$	$\frac{3}{4} \div \frac{1}{2} =$	$4\frac{1}{2} \div 3 =$
2.	$3\frac{1}{2} \times 2\frac{1}{2} =$	$5 \div 1\frac{1}{9} =$	$\frac{1}{4} \div 3 =$	$9\frac{3}{4} - 8\frac{2}{3} =$
3.	$\frac{2}{3} \div \frac{5}{6} =$	$6\frac{1}{4} \div 2\frac{1}{2} =$	$2\frac{1}{4} \div 6 =$	$7\frac{5}{6} + 8\frac{1}{2} =$
4.	$9\frac{1}{2} \times 8 =$	$6\frac{1}{4} - 2\frac{1}{2} =$	$6\frac{3}{4} + 2\frac{5}{6} =$	$4\frac{1}{2} \div 13\frac{1}{2} =$



Scale Drawings in a Dictionary

The pictures above show how scale drawings are used in dictionaries. The ($\times 5$) below the picture of the housefly means that the drawing is five times the natural size.

1. For which insect is the picture half the natural size?

2. For which insect is the picture the natural size?

3. Which of the three insects is actually the smallest in size? the largest in size? How can you tell from the drawings?

4. Use your ruler to find the length and width of the locust. Why is it not easy to find the measurements?

5. Measure the spread from tip to tip of the wings of the butterfly. Estimate the actual spread of the wings.

TIGER (1/50)

6. The picture at the left is part of a definition of the word "tiger." How many times as large as the picture is the actual size of the tiger? See if you can find illustrations of this kind in some dictionary.

★ 7. Why are scale drawings of insects and animals sometimes larger, sometimes smaller, than the natural size?

★ 8. Suppose the sides of a 3- $\times$ 4-inch rectangle are doubled. How many times as large is the rectangle formed?

Diagnostic Test in Division of Common Fractions by Whole Numbers

First work the first two examples in each row of examples in the diagnostic test on page 244. Correct your errors.

Next work the examples below, a row at a time. Check.

	a	b	c	d	
1.	$\frac{1}{2} \div 2 =$	$\frac{3}{5} \div 4 =$	$\frac{6}{7} \div 3 =$	$\frac{4}{5} \div 8 =$	(246)
2.	$3\frac{1}{2} \div 2 =$	$5\frac{1}{4} \div 3 =$	$7\frac{1}{2} \div 5 =$	$8\frac{1}{3} \div 6 =$	(248)
3.	$2\frac{2}{3} \div 4 =$	$3\frac{1}{3} \div 5 =$	$1\frac{1}{4} \div 7 =$	$3\frac{1}{10} \div 10 =$	(248)

For help, turn to the page given at the right.

★Special Work for Those Who Made No Errors

Find the missing numbers in the examples below.

1. $95 = 19 \times ?$
2. $38 \times ? = 342$
3. $5280 = ? \times 88$
4. $7 \times ? = 3\frac{1}{2}$
5. $5\frac{1}{2} = 4 \times ?$
6. $\frac{3}{4} = ? \times \frac{1}{2}$
7. $? \div 2\frac{1}{2} = 10$
8. $12\frac{1}{2} \div ? = 2\frac{1}{2}$
9. $\frac{3}{4} \div ? = 4$

10. Try to find the missing numbers in the example at the right. First copy the example with the question marks. Then study the work and try to find the missing numbers. You may begin with any part of the example. As soon as you think you have found a missing number, erase the question mark. Write the number in its place.

$$\begin{array}{r} 2?4 \\ ?3\overline{)17?6?} \\ \underline{166^{\times\times}} \\ 11? \\ \underline{8?} \\ ?3? \\ \underline{3??} \end{array}$$

Make up an example of your own like this one.

Find the missing numbers in the examples below.

11.
$$\begin{array}{r} 4?1 \\ 25? \\ \underline{?84} \\ 900 \end{array}$$

12.
$$\begin{array}{r} ?01? \\ \underline{-2?64} \\ 62?6 \end{array}$$

13.
$$\begin{array}{r} 98?7 \\ \underline{\times 6} \\ 5?84? \end{array}$$

14.
$$\begin{array}{r} ??\ \text{r}5 \\ 36\overline{)????} \\ \underline{180^{\times}} \\ 5 \end{array}$$

Getting What You Pay For

The men are testing the scales to see if they weigh accurately. Suppose a pound of butter is weighed on three different scales. It will probably not weigh exactly the same on all of them. It is almost impossible to keep scales accurate. So our government allows a small amount of error in measurements. This is called **tolerance.**

1. Suppose that a scales measures $16\frac{1}{4}$ ounces to the pound. How much does the dealer lose on each pound he weighs on this scales? How much on a 10-pound bag of sugar?

2. A scales weighs $15\frac{7}{8}$ ounces to the pound. How much does the customer lose on a 10-pound bag of sugar?

3. A shipment of 50 pounds of butter weighed 48 pounds. How many ounces was the average error on each pound?

4. In measuring 6 yards of cloth, a clerk gave the customer a piece 5 yards 30 inches long. How many inches short was that on each yard of cloth?

5. On a 5-gallon measure an error of less than $\frac{3}{8}$ pint is allowed in one state. How large an error is that to a gallon?

★6. Has your state an inspector of weights and measures?

Test in Division of Fractions

	a	b	c	d
1.	$5 \div 2\frac{1}{2} =$	$2 \div \frac{4}{5} =$	$1\frac{1}{4} \div 4 =$	$1\frac{1}{2} \div \frac{1}{4} =$
2.	$\frac{5}{6} \div 2 =$	$\frac{5}{8} \div \frac{5}{8} =$	$1 \div \frac{2}{3} =$	$4\frac{4}{5} \div 6 =$
3.	$\frac{5}{6} \div \frac{3}{10} =$	$5\frac{2}{5} \div 1\frac{4}{5} =$	$3 \div 4\frac{1}{2} =$	$1 \div 3\frac{3}{10} =$
4.	$4 \div 1\frac{1}{2} =$	$3 \div \frac{2}{5} =$	$1 \div 2\frac{5}{8} =$	$4 \div 3\frac{1}{2} =$
5.	$\frac{3}{4} \div 2 =$	$\frac{7}{8} \div \frac{7}{8} =$	$2\frac{3}{4} \div \frac{5}{6} =$	$1\frac{4}{5} \div \frac{1}{8} =$

★Prove Your Answer Is Right

1. Does multiplying both terms of a fraction by the same number increase its value?

2. Does dividing both terms of a fraction by the same number change the value of the fraction?

3. Does multiplying the numerator of a fraction by a whole number increase the value of the fraction?

4. Can the product of two proper fractions ever be greater than 1?

5. Is the answer to $1\frac{1}{4} \div 2\frac{1}{2}$ less than 1?

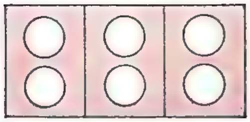
6. Are 12 ounces equal to $\frac{3}{4}$ pound?

7. The total weight of 4 chickens is $13\frac{1}{2}$ pounds. Is the average weight of the chickens less than 4 pounds?

Using the Vocabulary of Arithmetic

Be ready to explain the words below.

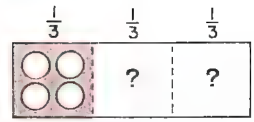
account	billion	invert	thousand
approximate	bushel	numerator	thousandth
area	cancel	round off	tolerance
average	divisor	scale drawing	units
bill	expenses	square yard	wages

A 

$\frac{1}{3}$ of 6 = ?

B 

2 = what part of 8?

C 

$4 = \frac{1}{3}$ of ?

Three Problems in Fractions

1. Use A to tell how much $\frac{1}{3}$ of 6 is.
   Here we are finding a **fractional part of a group.**

2. Use B to find what fractional part 2 is of 8.
   Think: $1 = \frac{1}{8}$ of 8. So 2 is $\frac{2}{8}$ of 8, or $\frac{1}{4}$ of 8.

3. Tell what part 4 is of 8; of 12; of 6; of 20.

In problems 2 and 3 we are finding **what part one number is of another.**

4. C shows that $4 = \frac{1}{3}$ of a number. The whole of anything is 3 thirds ($\frac{3}{3}$). If 4 is one of the thirds of the number, then the whole number will be 3×4, or 12. Prove that 4 is $\frac{1}{3}$ of 12.

5. Make a drawing to find the number $\frac{1}{4}$ of which is 3.

In problems 4 and 5 we are **finding the whole number when only part of the number is given.**

Find the missing numbers in the examples below.

	a	b	c
6.	$\frac{1}{3}$ of 15 = ?	5 = ? of 15	$5 = \frac{1}{3}$ of ?
7.	$\frac{1}{4}$ of 16 = ?	4 = ? of 20	$4 = \frac{1}{6}$ of ?
8.	$\frac{1}{5}$ of 20 = ?	3 = ? of 18	$6 = \frac{1}{4}$ of ?
9.	12 = ? of 24	$16 = \frac{1}{2}$ of ?	20 = ? of 30
10.	$9 = \frac{1}{3}$ of ?	$\frac{1}{4}$ of 20 = ?	30 = ? of 50
11.	48 = ? of 80	$12 = \frac{1}{5}$ of ?	$\frac{1}{3}$ of 105 = ?

MORE PRACTICE

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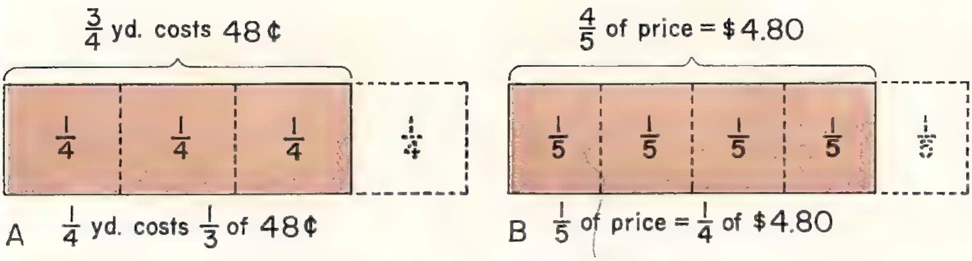
12. In a class of 40 children there were 25 boys. What fraction of the class were boys? What fraction were girls?

13. Find the cost of $\frac{1}{4}$ yard of ribbon at 40 cents a yard.



Finding the Whole When a Part Is Given

1. If $\frac{3}{4}$ yard of ribbon costs 48 cents, how much does $\frac{1}{4}$ yard cost? Use A to find the answer.

Think: If $\frac{3}{4}$ yard costs 48¢, $\frac{1}{4}$ yard costs $\frac{1}{3}$ of 48¢, or ?¢?

2. How much does 1 yard ($\frac{4}{4}$ yard) cost if $\frac{1}{4}$ yard costs 16 cents?

Think: $\frac{1}{4}$ yd. costs 16¢. So $\frac{4}{4}$ yd. costs 4 × 16¢ = ?¢. How much is $\frac{3}{4}$ of 64?

3. At a "$\frac{1}{5}$-off sale" Tom bought a baseball mitt for \$4.80, or $\frac{4}{5}$ of the regular price. What was the regular price? Use B to find the answer.

Think: $\frac{4}{5}$ of regular price = \$4.80. So $\frac{1}{5}$ of the regular price is $\frac{1}{4}$ of \$4.80, or \$1.20. The whole ($\frac{5}{5}$) of the regular price is 5 × \$1.20, or ?. $\frac{4}{5}$ of \$6.00 = ?

4. On a spelling test Ann had 18 words correct. This was $\frac{9}{10}$ of the words in the test. How many words were there in the test? 18 = $\frac{9}{10}$ of ? Check the answer.

5. A baseball team won 120 games. This was $\frac{3}{5}$ of all the games the team played. 120 = $\frac{3}{5}$ of what number?

6. 9 = $\frac{3}{4}$ of ?	9. 3 = $\frac{3}{4}$ of ?	12. \$40 = $\frac{2}{3}$ of ?
7. 12 = $\frac{2}{3}$ of ?	10. 10 = $\frac{4}{5}$ of ?	13. \$150 = $\frac{3}{4}$ of ?
8. 10 = $\frac{5}{6}$ of ?	11. 50c = $\frac{2}{5}$ of ?	14. \$225 = $\frac{9}{10}$ of

★15. In the Russell School, $\frac{3}{5}$ of the children are boys. There are 270 boys. How many girls are there?

MORE PRACTICE 363

Making Candy for the Candy Sale

The girls are using this recipe to make chocolate fudge. It makes a pan of candy weighing about $1\frac{1}{4}$ pounds.

2 cups of sugar	2 squares of chocolate (1 oz. each)
$\frac{3}{4}$ cup of milk	3 tbs. of butter
	1 tsp. of vanilla

1. The girls made four times as much as this recipe. Make a list showing how much of each item they used.

2. A cup of sugar weighs $\frac{1}{2}$ pound. How many pounds were needed to make one pan of candy? 4 pans of candy?

3. A cup of milk is about $\frac{1}{2}$ pint. What part of a pint is $\frac{3}{4}$ cup of milk? Think: $\frac{3}{4}$ of $\frac{1}{2}$ pt. = ? pt.

4. How much milk was needed for 4 pans of candy?

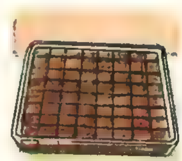
5. A cake of chocolate contains 8 squares. How many cakes of chocolate were needed for 4 pans of fudge? How many ounces is this? What fraction of a pound?

6. A cup of butter weighs $\frac{1}{2}$ pound. There are 16 level tablespoons of butter in a cup. Therefore a tablespoonful of butter weighs $\frac{1}{16}$ of 8 ounces or how many ounces? How many ounces do 3 tablespoonfuls of butter weigh? How many ounces of butter were needed to make 4 pans of fudge?

7. The girls estimated that the cost of making a pan of fudge would be as shown at the right. Find the total cost of one pan of fudge; of 4 pans of fudge.

Sugar	10¢
Milk	4¢
Chocolate	8¢
Butter	8¢
Vanilla	1¢
Total	?

8. They poured the fudge into 8- × 8-inch square cake pans. The girls decided to cut the candy into 1-inch squares. Into how many inch squares could they cut an 8- × 8-inch pan of candy?



9. How many inch squares would there be in 4 pans of candy?

10. The girls sold 8 pieces of candy in a bag at 15 cents a bag. How much did they receive for each pan of candy?

11. How much more did they receive for a pan of candy than the material cost?

12. How many bags containing 8 pieces each did they make with the 4 pans of candy?

13. How much did they receive for all the candy if they sold all the bags?

14. How much more did they receive than the cost of the materials needed? (See problem 7.)

★15. What are expenses a candy shop has that the girls did not have in making their candy?

Checking Up on Quotients

A	B	C	D
$1 \div \frac{1}{4} =$	$\frac{1}{2} \div \frac{1}{4} =$	$1\frac{1}{2} \div 1\frac{1}{2} =$	$1\frac{1}{2} \div 2 =$
$1 \div \frac{3}{8} =$	$\frac{1}{8} \div \frac{1}{4} =$	$2\frac{1}{4} \div 1\frac{1}{8} =$	$5\frac{1}{3} \div 4 =$
$2 \div \frac{2}{3} =$	$\frac{5}{6} \div \frac{2}{3} =$	$1\frac{1}{3} \div 2\frac{2}{3} =$	$\frac{1}{2} \div 3 =$
$5 \div \frac{3}{4} =$	$\frac{7}{8} \div \frac{7}{8} =$	$3\frac{1}{5} \div 1\frac{1}{3} =$	$8\frac{1}{4} \div 8 =$

1. Find the answers to set A. What kinds of numbers are the quotients? Why must they all be greater than 1?

2. What kinds of numbers are the quotients in set B? Which of the quotients in set B is less than the number being divided? How can you tell by examining the numbers in a division example that the quotient is 1? How can you tell that the quotient is greater than 1? less than 1?

3. Examine the four examples in set C. In which examples will the quotient be equal to 1? less than 1? greater than 1? Divide to see if your answers are correct.

4. Examine the four examples in set D. In which examples will the quotient be less than 1? How can you tell? In which examples will the quotient be greater than 1? Divide to see if your answers are correct.

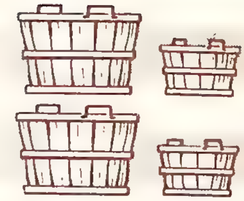
5. In which of the examples below can you be sure that the quotient will be less than 1? greater than 1? Tell why. Check your answers by dividing the numbers.

MORE PRACTICE 364

a. $\frac{3}{4} \div \frac{3}{8} =$ b. $2\frac{1}{2} \div 3 =$ c. $4\frac{1}{2} \div 2\frac{1}{4} =$ d. $1\frac{1}{2} \div 2\frac{1}{4} =$

A

B



Dividing Measures

1. How many bushels and pecks are shown in A above?

2. In B above, the total is divided into two equal groups.

$$\begin{array}{r} \textbf{1 bu. 1 pk.} \\ 2\overline{)\textbf{2 bu. 2 pk.}} \end{array}$$

How many are there in each group?
Let us divide without using the drawings. First divide the bushels, then the pecks.

C

D

3. Use the drawings C and D above to find half of 3 bushels 2 pecks. Now divide without using the drawings.

$$2\overline{)\textbf{3 bu. 2 pk.}} = \begin{array}{r} \textbf{1 bu. 3 pk.} \\ 2\overline{)\textbf{2 bu. 6 pk.}} \end{array}$$

Why do we change 3 bu. 2 pk. to 2 bu. 6 pk.? How do we change the numbers?

4. There is another way to divide 3 bushels 2 pecks by 2. Express the total as $3\frac{1}{2}$ bushels. Then divide by 2. How much is $3\frac{1}{2} \div 2$?

Use both methods to divide in the following examples.

5. 6 ft. 9 in. by 3.
6. 7 qt. 1 pt. by 4.
7. 5 hr. 15 min. by 2.
8. 8 yd. 2 ft. by 3.
9. 6 lb. 8 oz. by 5.
10. 7 gal. 3 qt. by 4.

MORE PRACTICE 364

11. How many boards 2 feet 6 inches long can be cut from a board 10 feet long? Hint: Change 2 ft. 6 in. to feet.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pork (fat)	4 oz.	544	Fish	$3\frac{1}{2}$ oz.	98
Beef (lean)	4 oz.	282	Egg (1)	$1\frac{4}{5}$ oz.	79
Poultry	$3\frac{1}{3}$ oz.	173	Bread (1 slice)	1 oz.	76
Milk (1 glass)	7 oz.	138	Butter	$\frac{1}{3}$ oz.	73
Potatoes	5 oz.	128	Vegetables (fresh)	$3\frac{1}{2}$ oz ($\frac{1}{2}$ cup)	41
Cheese	1 oz.	107	Sugar	$\frac{1}{3}$ oz. (2 tsp.)	40

What Foods Should We Eat?

The unit that is used to measure food value is the **calorie.** Children of ages 11 and 12 need from 2,100 to 2,400 calories a day. The table above shows the size of servings and the number of calories in one serving of some important foods.

1. What fraction of a pound is a serving of cheese? a serving of potatoes? a serving of pork?

2. Find how many servings there are in 1 pound of pork; of poultry; of butter.

3. How many ounces do a dozen eggs weigh? How much more than a pound is this?

4. How many calories are there in 1 ounce of fish? in 1 ounce of butter? in 1 ounce of sugar?

5. How many calories are there in a pound of pork? of beef? of cheese?

6. How many calories are there in 2 glassfuls of milk and a slice of bread? How many calories in two eggs?

★ 7. Make up a dinner of 1,200 calories. Use the table.

★ 8. Make up problems using facts given in the table.

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	8397	\$97.64	6.427	987.4	9.85
	486	8.79	9.874	68.7	27.67
	5659	80.06	.306	3027.3	.08
2.	$7\frac{1}{2}$	$9\frac{3}{4}$	$7\frac{4}{5}$	$9\frac{7}{8}$	$7\frac{5}{6}$
	$6\frac{1}{2}$	$8\frac{1}{8}$	$6\frac{1}{2}$	$8\frac{3}{4}$	$8\frac{1}{2}$
	$4\frac{1}{2}$	$6\frac{1}{2}$	$4\frac{7}{10}$	$6\frac{1}{2}$	$4\frac{2}{3}$
3.	6 ft. 4 in.	4 qt. $1\frac{1}{2}$ pt.	9 hr. 45 min.	4.75 ft.	$7\frac{3}{4}$ hr.
	2 ft. 7 in.	6 qt. 1 pt.	4 hr. 30 min.	1.25 ft.	$6\frac{1}{2}$ hr.

Practice Test in Subtraction

1.	7010	\$89.00	648.7	84.763	962.48
	2649	27.53	259.9	25.739	279.39
2.	$4\frac{1}{4}$	$6\frac{1}{2}$	$4\frac{4}{5}$	8 lb. 3 oz.	8 yd. 1 ft.
	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{9}{10}$	4 lb. 8 oz.	2 yd. 3 ft.

Practice Test in Multiplication

1.	396	794	867	\$84.69	2 lb. 6 oz.
	48	509	760	231	3

2. $6\frac{1}{2} \times 4\frac{2}{3} =$ $27 \times 3\frac{2}{3} =$ $24\frac{3}{4} \times 10 =$ $\frac{3}{4} \times \frac{8}{9} =$ $4\frac{1}{6} \times \frac{4}{5} =$

Practice Test in Division

	a	b	c	d
1.	$3 \div \frac{2}{3} =$	$7\frac{1}{2} \div 1\frac{1}{4} =$	$9\frac{1}{3} \div 7 =$	$2\frac{1}{4} \div \frac{3}{4} =$
2.	2)4 ft. 6 in.	8)12 yd. 4 ft.	3)8 hr. 15 min.	$\frac{3}{4} \div 6\frac{2}{3} =$

Checking on Important Points

1. Give the value of each figure in 214.365.

2. Which is most: .3, 1.1, or .95?

3. In what ways are the multiplication and division of fractions alike? In what ways are they different?

4. Round off to the nearest thousand: 8,157; 9,864; 7,500; 27,040; 467,138; 4,207,653.

420750

5. Write the largest five-place whole number possible.

6. How can you find the area of a table top?

7. Explain why $2\frac{1}{2} \div 5$ and $\frac{1}{5}$ of $2\frac{1}{2}$ give the same results.

8. Find the whole number if $\frac{3}{4}$ of the number is 15.

9. How do you find what part 10 is of 40?

10. What is the sum of the fractions $\frac{3}{4}$ and $\frac{5}{6}$?

11. Explain each step in working the examples below:

a. $3\frac{1}{2} \div 1\frac{3}{4} =$ b. $5 \div 7\frac{1}{2} =$ c. $4\frac{2}{3} \div 2 =$

★Information, Please!

1. How can you find the perimeter of a garden?

2. How is electricity measured?

3. Why are machines often used to make change?

4. What is an abacus?

5. How do clocks help people to live together?

6. In what ways are people paid for the work they do?

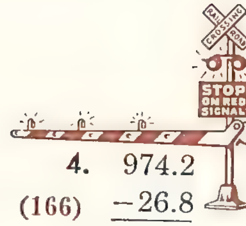
7. Why do not all countries use the same units of measure?

8. How is the money paid for automobile licenses used?

9. How has machinery reduced the labor of the farmer?

10. How is the food value of the things we eat measured?

Progress Test VII



1. $\begin{array}{r}18102\\ -9764\\ \hline\end{array}$ (15)	2. $\begin{array}{r}496\\ \times 807\\ \hline\end{array}$ (139)	3. $\begin{array}{r}7.684\\ +9.518\\ \hline\end{array}$ (180)	4. $\begin{array}{r}974.2\\ -26.8\\ \hline\end{array}$ (166)
5. $48\overline{)3744}$ (58)	6. $\begin{array}{r}5\frac{3}{4}\\ \times 8\\ \hline\end{array}$ (200)	7. $\begin{array}{r}14\\ \times 4\frac{2}{3}\\ \hline\end{array}$ (202)	8. $26\overline{)2061}$ (60)
9. $\begin{array}{r}7\frac{3}{4}\\ -6\frac{1}{2}\\ \hline\end{array}$ (100)	10. $15\overline{)10{,}957}$ (66)	11. $\begin{array}{r}8\frac{1}{4}\\ -2\frac{3}{8}\\ \hline\end{array}$ (111)	12. $\begin{array}{r}6\frac{2}{3}\\ -4\frac{3}{4}\\ \hline\end{array}$ (113)
13. $\frac{3}{4}\times\frac{5}{6}=$ (208)	14. $5\frac{1}{2}\times 3\frac{1}{3}=$ (215)	15. $\begin{array}{r}6\text{ qt. }1\frac{1}{2}\text{ pt.}\\ \times 6\\ \hline\end{array}$ (217)	16. $\begin{array}{r}4'\,8\frac{1}{2}''\\ +6'\,7\frac{3}{4}''\\ \hline\end{array}$ (151)
17. $5\div\frac{2}{3}=$ (236)	18. $4\frac{1}{2}\div 3\frac{3}{4}=$ (239)	19. $1\frac{1}{2}\div 9=$ (248)	20. $24=\frac{3}{4}$ of ? (255)

For help, turn to the page given below the number of the example.

★Special Work to Do

1. Explain how we change $\frac{4}{6}$ to $\frac{2}{3}$; to $\frac{8}{12}$.

2. How do we find $\frac{2}{3}\times\frac{2}{3}$?

3. How do we divide $\frac{4}{9}$ by $\frac{2}{3}$? What is the quotient?

4. What are the steps in the work shown below?

$$\frac{4}{9}\div\frac{2}{3}=\frac{4\div 2}{9\div 3}=\frac{2}{3}$$ Is the answer correct?

5. Show that the answer to $\frac{3}{4}\div\frac{1}{4}$ is the same as $3\div 1$.

6. Why can you not use the method in problems 4 or 5 to divide $\frac{3}{4}$ by $\frac{2}{3}$?

7. Change $\frac{3}{4}$ and $\frac{2}{3}$ to twelfths and divide as in problem 5. Check by inverting the divisor and multiplying.

8. Divide $1\frac{1}{5}$ by $2\frac{1}{2}$ as in problem 7.

Test in Problem Solving VII

1. Find the cost of $\frac{3}{4}$ yard of lace at 60 cents a yard.

2. Find the cost of a can of corn if a box of 24 cans costs \$4.56.

3. Bob wants to cut a board 9 feet long into 4 equal pieces. How long should each piece be?

4. Agnes saw some 45-cent stockings on sale at 32 cents a pair. How much would Agnes save by buying 4 pairs of the stockings?

5. One fourth pound of dried beef costs 32 cents. How much does 1 pound of dried beef cost?

6. Cans of peaches are on sale at 2 for 57 cents. How much do a dozen cans cost?

7. If 6 hens weigh $19\frac{1}{2}$ pounds, what is their average weight?

8. Martha helped a neighbor $2\frac{1}{2}$ hours in the morning and $3\frac{3}{4}$ hours in the afternoon. How much did she earn if she was paid 40 cents an hour?

9. How many pennants, each $\frac{3}{4}$ yard long, can be made from a piece of cloth $4\frac{1}{2}$ yards long?

10. The cost of using a toaster is $3\frac{1}{2}$ cents an hour. How much is the cost of using it for 20 minutes?

Did you beat your score on the last test?

CHAPTER VIII

Faster and Faster

1. The American record for the 100-yard dash was 10.5 seconds in 1864. It was 9.8 seconds in 1895, and 9.4 seconds in 1950. How much faster was the record for 1895 than for 1864? How much faster for 1950 than for 1864?

2. The American record for the one-mile run was 4:56.0 (4 minutes 56.0 seconds) in 1864. It was 4:17.0 in 1895, and 4:03.7 in 1954. How much slower was the time for 1864 than for 1954? for 1895 than for 1954?

3. In 1898 one of our first automobiles made a record of 39.24 miles an hour. In 1910 the record was 131.72 miles an hour. In 1947 the record was 394.20 miles an hour. How much was the increase in speed from 1898 to 1910? from 1898 to 1947? from 1910 to 1947?

4. In 1906 one of the world's first airplanes flew at the rate of 25.660 miles an hour. Top speed of airplanes was 100.220 miles an hour in 1912. In 1953 it was 755.149 miles an hour. Find the increase in speed from 1906 to 1912; from 1906 to 1953; from 1912 to 1953.

★5. Find out if recent records are faster.

Ours Is a Decimal Number System

The number system that we use is called a decimal system because it is built with tens.

1. Show that the following are correct:

A	B
$10 \times 1 = 10$	$10\overline{)10} = 1$ or $\frac{1}{10}$ of $10 = 1$
$10 \times 10 = 100$	$10\overline{)100} = 10$ or $\frac{1}{10}$ of $100 = 10$
$10 \times 100 = 1000$	$10\overline{)1000} = 100$ or $\frac{1}{10}$ of $1000 = 100$

Use A to answer the first three questions below.

2. How many places to the left is 1 moved when we multiply 1 by 10? How many times as much as 1 is 10?

3. How many places to the left is the 1 in 10 moved when we multiply 10 by 10? How many times as much as 10 is 100?

4. How many places to the left is the 1 in 100 moved when we multiply 100 by 10? How many times as much as 100 is 1,000?

Now use B to answer the next three questions.

5. How many places to the right is the 1 in 10 moved when we divide 10 by 10? What part of 10 is 1?

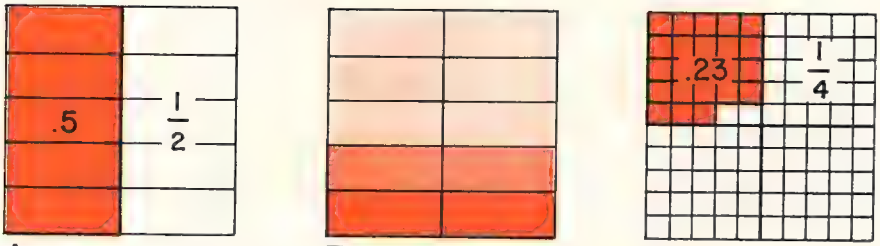
6. How many places to the right is the 1 in 100 moved when we divide 100 by 10? What part of 100 is 10?

7. How many places to the right is the 1 in 1,000 moved when we divide 1,000 by 10? What part of 1,000 is 100?

8. Is this statement correct? **When we move a figure one place to the left, we multiply its value by 10.**

9. Is this statement correct? **When we move a figure one place to the right, we divide its value by 10.**

10. How does the value of the 2 in 222 change in going from right to left? in going from left to right?



A B C

Comparing Common and Decimal Fractions

1. Compare .5 with $\frac{1}{2}$. See A.

An easy way to do this is to change .5 to a common fraction. $.5 = \frac{5}{10} = \frac{1}{2}$. Therefore, .5 and $\frac{1}{2}$ are the same.

Another way to compare .5 and $\frac{1}{2}$ is to change $\frac{1}{2}$ to tenths. $\frac{1}{2} = \frac{5}{10} = .5$. Therefore, .5 and $\frac{1}{2}$ are the same.

2. Change these fractions to tenths and express them in decimal form: $\frac{1}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{2}{5}$. See B above.

3. Which is the greater value, $\frac{1}{4}$ or .23? See C.

Change $\frac{1}{4}$ to hundredths. $\frac{1}{4} = \frac{25}{100} = .25$.
You can see that $\frac{1}{4}$ is greater than .23.

4. Change these fractions to hundredths. Then express them in decimal form: $\frac{3}{4}$, $\frac{1}{25}$, $\frac{7}{25}$, $\frac{19}{20}$, $\frac{29}{50}$, $\frac{1}{20}$.

5. Which is greater, .25 foot or .5 foot?

Think: In .25 there are only 2 tenths. In .5 there are 5 tenths. So .5 is greater than .25.

6. Which is greater, .6 or .74? .1 or .05? 1.38 or 2.4?

7. Which is greater, $\frac{2}{5}$ or .25? $\frac{1}{4}$ or .22?

8. Which of the numbers below has the largest value?

$\frac{2}{5}$, .8, $\frac{1}{4}$, .46, $\frac{3}{10}$, .09

9. Arrange the numbers above in order of value. Begin with the number that has the smallest value.

10. Express as thousandths: $\frac{7}{10}$; $\frac{27}{100}$; $\frac{3}{4}$.

11. Which has the greatest value: .4, .35, or .275?

12. Which of the above numbers has the least value?

Two Ways of Adding Fractions

We can find $\frac{1}{10} + \frac{1}{2}$ by using either common fractions or decimal fractions as shown below.

With Common Fractions

$$\begin{array}{rcl} \frac{1}{10} & = & \frac{1}{10} \\ \frac{1}{2} & = & \frac{5}{10} \\ \hline & & \frac{6}{10} = \frac{3}{5} \end{array}$$

With Decimal Fractions

$$\begin{array}{rcr} \frac{1}{10} & = & .1 \\ \frac{1}{2} & = & .5 \\ \hline & & .6 \end{array}$$

Why do we change the $\frac{6}{10}$ to $\frac{3}{5}$? We do not change the .6.

1. Which way of adding seems simpler? Why?

First find the sums using common fractions. Then add using decimal fractions as shown above.

2. $\frac{3}{10} + \frac{1}{2} =$
3. $\frac{1}{2} + \frac{4}{10} =$
4. $\frac{3}{5} + \frac{7}{10} + \frac{1}{2} =$
5. $\frac{1}{5} + \frac{3}{5} + \frac{1}{10} =$
6. $2\frac{1}{5} + \frac{1}{2} + 4\frac{1}{10} =$
7. $\frac{4}{5} + 6\frac{1}{2} + 3\frac{7}{10} =$
8. Show how to find $\frac{3}{4} + \frac{21}{100}$ in two ways.

★9. Show how to find $\frac{3}{10} + \frac{24}{100} + \frac{375}{1000}$ in two ways.

Two Ways of Subtracting Fractions

1. How much is $3\frac{1}{2} - 1\frac{7}{10}$?

With Common Fractions

$$\begin{array}{rcrcr} 3\frac{1}{2} & = & 3\frac{5}{10} & = & 2\frac{15}{10} \\ -1\frac{7}{10} & = & 1\frac{7}{10} & = & 1\frac{7}{10} \\ \hline & & & & 1\frac{8}{10} = 1\frac{4}{5} \end{array}$$

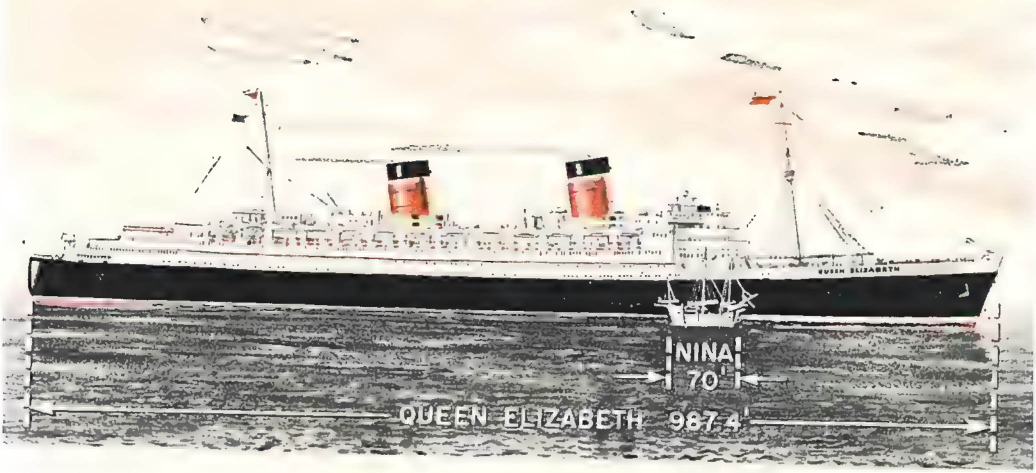
With Decimal Fractions

$$\begin{array}{rcr} 3\frac{1}{2} & = & 3.5 \\ -1\frac{7}{10} & = & 1.7 \\ \hline & & 1.8 \end{array}$$

Which way of subtracting seems simpler? Why?

First subtract the numbers using common fractions. Then subtract using decimal fractions.

2. $9\frac{1}{2} - 2\frac{1}{10} =$
3. $6\frac{3}{10} - 1\frac{1}{2} =$
4. $5\frac{3}{5} - 1\frac{1}{2} =$
5. $6\frac{1}{10} - 1\frac{1}{2} =$
6. $7\frac{19}{100} - 2\frac{15}{100} =$
7. $6\frac{1}{2} - 2\frac{24}{100} =$
8. $4\frac{1}{5} - 2\frac{3}{100} =$
9. $9\frac{1}{4} - 2\frac{7}{10} =$
10. $6\frac{1}{2} - 3\frac{72}{100} =$
11. $9\frac{375}{1000} - 4\frac{3}{10} =$
12. $8\frac{9}{1000} - 6\frac{7}{10} =$
13. $4\frac{1}{2} - 3\frac{7}{100} =$



How Large Are Ships?

The dimensions of four famous ships are given below:

	Length	Breadth	Depth
America (U.S.)	663.6 ft.	93.5 ft.	30.4 ft.
Liberté (F.)	890.2 ft.	102.1 ft.	48.0 ft.
New Amsterdam (N.)	713.7 ft.	88.3 ft.	55.8 ft.
Queen Elizabeth (Br.)	987.4 ft.	118.6 ft.	68.4 ft.

1. Which of the four ships has the greatest length?

2. How much longer is the Queen Elizabeth than the New Amsterdam? than the Liberté?

3. How much shorter than the Liberté is the America?

4. How much less is the breadth of the America than that of the Queen Elizabeth?

5. How much wider than the New Amsterdam is the America?

6. How much more is the depth of the Queen Elizabeth than of the Liberté?

★ 7. Why is the Nina famous?

Annexing Zeros to Decimals

1. Are \$4 and \$4.00 different in value?

2. Write seven dollars in two ways. Is the value of \$7 changed by placing a decimal point after the \$7 and **annexing** two zeros?

3. Show that 5 dimes have the same value as \$.50.

4. Explain why 4.0 has the same value as 4.

5. Does 2.9 have the same value as 2.90?

   Think: a. $2.9 = 2\frac{9}{10}$ b. $2.90 = 2\frac{90}{100} = 2\frac{9}{10}$

   Therefore, 2.9 and 2.90 have the same value.

6. Show that 4.1 and 4.100 have the same value.

7. Show that 2.5, 2.50, and 2.500 have the same value.

Annexing or removing zeros at the right of a decimal fraction does not change its value.

8. Express as hundredths: .4; .7; .1; .5.

9. Express as thousandths: .2; .36; .03; .40.

10. Show that $5.800 = 5.80 = 5.8$.

11. Express as tenths: .10; .80; .700; .900.

12. Express as hundredths: .740; .600; .050; .150.

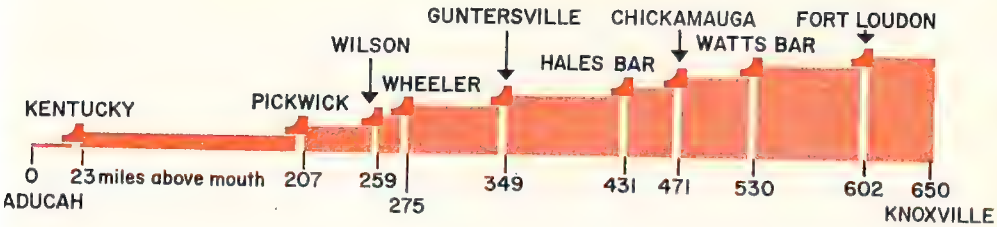
13. Which is greater, .375 or .40?

14. Change the following pairs of decimal fractions to like decimals. Then tell which one is greater.

   a. .39, .4 b. .5, .275 c. .30, .296 d. .7, .084

Practice What You Have Learned

	a	b	c	d	e
1.	$\begin{array}{r}29.64\\+36.89\\\hline\end{array}$	$\begin{array}{r}.003\\+.008\\\hline\end{array}$	$\begin{array}{r}6.4\\-1.9\\\hline\end{array}$	$\begin{array}{r}.874\\-.287\\\hline\end{array}$	$\begin{array}{r}81.37\\-24.47\\\hline\end{array}$
2.	$7 \times \frac{3}{4} =$	$8\frac{1}{2} \times 6\frac{1}{4} =$	$9\frac{1}{2} - 4\frac{3}{4} =$	$\frac{3}{4} \div \frac{1}{2} =$	$5\frac{1}{4} \div 2\frac{1}{4} =$
3.	$\begin{array}{r}\$4.80\\\times 20\\\hline\end{array}$	$\begin{array}{r}\$6.48\\\times 809\\\hline\end{array}$	$\frac{3}{4}$ of $72 =$	$12\overline{)967}$	$\frac{72}{10} =$



A Profile of the Tennessee River

The drawing above shows the distances between dams on the Tennessee River. The table at the right shows the heights above sea level of the gates at each dam.

Height of Gates above Sea (feet)	
Kentucky	375
Pickwick	418
Wilson	507.8
Wheeler	566.3
Guntersville	595.4
Hales Bar	629.3
Chickamauga	685.4
Watts Bar	745
Fort Loudoun	815

1. Use the figures at the bottom of the drawing to find how far it is from Paducah to Knoxville.

2. How far is it from Kentucky Dam to Knoxville? to Fort Loudoun?

3. How far is it from Wilson to Chickamauga?

4. Use the table to find the height above sea level of the gates of Kentucky Dam.

5. How much lower are the gates of Kentucky Dam than Fort Loudoun? This difference shows how much drop there is in the river between the two dams.

6. What is the drop in the river from Guntersville to Wheeler? from Hales Bar to Wheeler?

7. Is the drop from Wilson to Pickwick as great as from Wheeler to Wilson? Find the difference.

★8. Between what two dams in the list is the drop greatest?

★9. How do the dams help and protect the people living in and near the Tennessee Valley?

Are You Ready for Multiplication of Decimals?

Let's review multiplication before beginning the work with multiplication of decimals.

I. Work the first example in each row of examples in the diagnostic test on page 21.

II. Work the first two examples in each row in the diagnostic test in multiplication of fractions on page 223.

III. Find the products. Be sure to point off dollars and cents. Check your answers by division.

1.	2.	3.	4.	5.
$.24	$.96	$4.20	$.02	$.06
3	5	2	4	8

IV. Tell which number after each example below is nearest the correct product. Check your estimate. If you need help, turn to page 38.

1. 7 × $2.90 = $14, $16, $20.
2. 6 × $8.18 = $49, $52, $36.
3. 9 × $16.75 = $152, $168, $145.

V. Express the products below with fractions and with decimals. If you need help, turn to page 267.

1. $\frac{3}{10} \times 7 =$ 2. $\frac{1}{10} \times \frac{7}{10} =$ 3. $\frac{1}{10} \times \frac{17}{100} =$ 4. $1\frac{1}{10} \times 3\frac{1}{10} =$

VI. Carrying in addition of decimals.

Find the sums:

1. .6 + .6 + .6 =
2. .15 + .15 + .15 =
3. .268 + .268 + .268 =
4. 3.5 + 3.5 + 3.5 + 3.5 =

If you need help, turn to page 182.

VII. Multiplying by 10 and 100.

1. 10×25 = 2. 10×360 = 3. 100×5 = 4. 100×786 =

If you need help, turn to page 137.

Cotton Is King

1. One year an average of 312.6 pounds of cotton lint was produced per acre in the United States. How much more was this than 254 pounds, the average for a number of years?

2. A bale of cotton weighs about 500 pounds. How much more than half a bale is a crop of 254 pounds an acre?

3. The champion picker in 1949 picked 92.7 pounds of cotton in 2 hours. Use addition to find how many pounds he could pick at that rate in 10 hours.

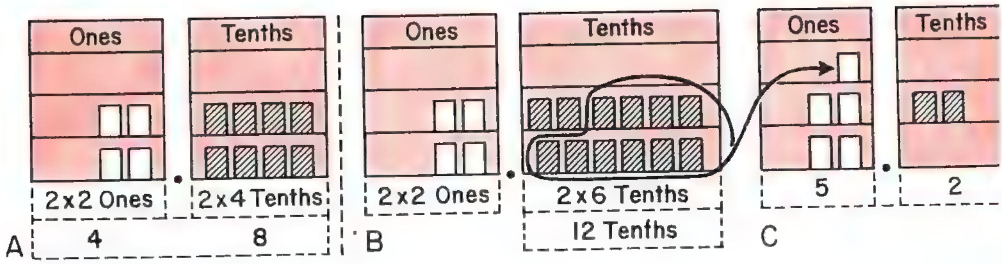
4. In 1938 the price of cotton was 7.81 cents a pound. In 1948 it was 33.14 cents a pound. How much higher was the price in 1948 than in 1938?

5. What was the value of a 500-pound bale of cotton at 33 cents a pound? at 8 cents a pound? Find the difference in the value of a bale at the two prices.

6. How much more was received for a 313-pound per acre crop at $.33 a pound than at $.08 a pound?

★7. One year 16,034,000 bales of cotton were produced in the United States. Find its value at $140 a bale.

★8. Why is cotton sometimes called "white gold"?



Multiplying a Decimal by a Whole Number

1. Use drawing A to find the product of 2×2.4.

What is the sum of the numbers shown in A?

2.4	2.4
+2.4	×2
4.8	4.8

Because the two numbers are the same, we can also multiply to find the total.

First multiply the tenths: $2 \times .4 = .8$.

Then multiply the ones: $2 \times 2 = 4$.

Because $2 \times .4$ is .8, the 8 must be in tenths' place in the product. The answer will have one decimal place.

2. Use drawings B and C to find 2×2.6.

2.6	2.6
+2.6	×2
5.2	5.2

When we add in B we get 12 tenths, or 1 and 2 tenths. Carry the 1 to ones' place. (See C.)

When we multiply the .6 by 2, we get 12 tenths, or 1 and 2 tenths. Write .2 in tenths' place and carry the 1 to ones' place.

Think: $2 \times 2 = 4$, and 1 make 5. Write 5 in ones' place.

When we multiply tenths by a whole number, we point off tenths in the product.

MORE PRACTICE 365

3. Tell how the products are found. Add to check.

a.	b.	c.	d.	e.
1.2	3.6	.3	.5	37.5
3	2	2	3	4
3.6	7.2	.6	1.5	150.0

4. Find the following products:

a	b	c	d	e	f
4.2	6.4	5.7	6.3	18.7	36.4
3	2	4	5	9	5

Multiplying Other Decimals by Whole Numbers

1. How much is 5×9.45?

$$\begin{array}{r} 9.45 \\ \times 5 \\ \hline 47.25 \end{array}$$

Multiply hundredths as in multiplying dollars and cents.

Because we are multiplying 45 hundredths by 5, we point off hundredths in the product.

9.45 is a little more than 9. We can tell that the product will be a little more than 5×9, or 45. Therefore, 47.25 is a sensible answer.

2. At sea, distances are measured in **nautical** miles. A nautical mile is equal to 1.152 land miles. How many land miles has a ship traveled after going 20 nautical miles?

$$\begin{array}{r} 1.152 \\ \times 20 \\ \hline 23.040 \end{array}$$

Multiply as with whole numbers.

Here we are multiplying thousandths by a whole number. We must point off thousandths, or three places, in the product. 1.152 is a little more than 1. So the product will be a little more than 20×1, or 20. Therefore, 23.040 is a sensible answer.

In each example below select the answer that you think is most sensible. Then multiply to see if you were right.

3. $4 \times 3.16 =$	12.64	126.4	1.264	1264
4. $5 \times 4.3 =$	215	21.5	2.15	.215
5. $7 \times 6.532 =$	45724	4572.4	45.724	457.24
6. $6 \times .93 =$	55.8	.558	5.58	558
7. $8 \times 6.7 =$	536	5.36	53.6	.536

8. Tell where to place the decimal points in the products.

a	b	c	d	e
$\begin{array}{r} 6.7 \\ 8 \\ \hline 536 \end{array}$	$\begin{array}{r} 2.54 \\ 4 \\ \hline 1016 \end{array}$	$\begin{array}{r} 3.648 \\ 30 \\ \hline 109440 \end{array}$	$\begin{array}{r} 13.84 \\ 10 \\ \hline 13840 \end{array}$	$\begin{array}{r} 27.5 \\ 7 \\ \hline 1925 \end{array}$

Practice in Multiplying Decimals

1. Explain how the decimal point is placed in the products below. Use estimation to show that the products are sensible.

a.	b.	c.	d.	e.
3.4	4.73	27.4	4.283	.23
× 2	× 3	× 6	× 5	× 4
6.8	14.19	164.4	21.415	.92

2. How can you tell how many decimal places to point off in the product of each example?

When multiplying a decimal by a whole number, point off as many places in the product as there are in the number being multiplied.

3. Apply this rule to the products above.

MORE PRACTICE 365

Multiply. Check your answer by estimating the product.

	a	b	c	d	e	f
4.	3.2	1.5	.34	4.8	54.6	38.7
	8	9	2	5	8	9
5.	.427	24.56	7.91	.8	4.27	2.96
	2	7	81	6	6	5
6.	3.04	.985	13.978	1.735	.462	9.156
	6	12	37	5	9	16

Practice What You Have Learned

1. Write as common fractions: .1, .01, .001. How many places are there in each decimal fraction? How many zeros in the denominator of the fraction with the same value?

	a	b	c	d
2.	$.64 + .39 =$	$4.2 - 3.6 =$	$6 \times 4.809 =$	$10 \times .38 =$
3.	$6\frac{1}{2} + 7\frac{7}{8} =$	$9\frac{2}{3} - 4\frac{5}{6} =$	$1\frac{1}{2} \times 2\frac{2}{3} =$	$4\frac{1}{2} \div 6 =$
4.	$9\frac{3}{4} + 2\frac{5}{6} =$	$6\frac{3}{8} - 2\frac{4}{5} =$	$10 \times 3\frac{3}{4} =$	$7 \div 2\frac{3}{4} =$

Multiplying by Four-Place Numbers

Multiplying by four-place numbers, such as 4276, is much like multiplying by two-place and three-place numbers.

1. How much is 2 × 3000?

   Think: 2 thousands × 3 = 6 thousands, or 6000.

2. Write the products of the following:

a. 4 × 1000 =	b. 8 × 2000 =	c. 12 × 2000 =
d. 46 × 4000 =	e. 40 × 5000 =	f. 304 × 8000 =

3. Study the work below which shows 1397 × 5426.

5426	To multiply by a four-place number, proceed
×1397	as in multiplying by three-place numbers.
37982	←First multiply 5426 by 7.
488340	←Then multiply 5426 by 90.
1627800	←Then multiply 5426 by 300.
5426000	←Then multiply 5426 by 1000.
7580122	Find the sum of the partial products.

4. Explain the work in the examples below.

a.	b.	c.
3024	4208	7216
×2006	×4200	×2040
18144	841600	288640
6048000	16832000	14432000
6066144	17673600	14720640

5. Copy and work the three examples with your book closed.

6. How much is 10 × 48? 100 × 48? 1000 × 48?

Give a rule for multiplying by 10, 100, or 1000.

7. 1478 × 2698 =	10. 9000 × 4865 =	13. 7108 × 9647 =
8. 4718 × 3754 =	11. 8070 × 8205 =	14. 9003 × 9170 =
9. 5006 × 9318 =	12. 2098 × 3967 =	15. 6500 × 7065 =

MORE PRACTICE 365

Multiplying Decimals by 10, 100, and 1000

Ann's father showed her the short-cut method of multiplying decimals by 10, 100, and 1000 explained below.

1. Show by estimation that the products below are correct.

A. $\begin{array}{r} 2.48 \\ \times 10 \\ \hline 24.80 \end{array}$ B. $\begin{array}{r} 2.48 \\ \times 100 \\ \hline 248.00 \end{array}$ C. $\begin{array}{r} 2.48 \\ \times 1000 \\ \hline 2480.00 \end{array}$

2. When we multiply 2.48 by 10 as in A, how many places is the decimal point moved? In what direction?

3. How many places to the right is the decimal point moved when we multiply 2.48 by 100 as in B? by 1000 as in C?

4. Tell how many places to the right the decimal point was moved in each product below. Show by estimation that the products are correct.

a. $\begin{array}{r} 3.65 \\ \times 10 \\ \hline 36.50 \end{array}$ b. $\begin{array}{r} 48.23 \\ \times 100 \\ \hline 4823.00 \end{array}$ c. $\begin{array}{r} 73.1 \\ \times 100 \\ \hline 7310.0 \end{array}$ d. $\begin{array}{r} .648 \\ \times 1000 \\ \hline 648.000 \end{array}$

To multiply a number by 10, move the decimal point one place to the right. To multiply by 100, move the decimal point two places to the right. To multiply by 1000, move the decimal point three places to the right. Annex zeros to the number to fill any empty places, as in c.

MORE PRACTICE 365

5. Use the short cut above to multiply each of these numbers by 10.

3.4 8.5 .6 2.75 .86 4.370 .004

6. Use the short cut to multiply each of the above numbers by 100; by 1000.

7. 8.6 = .86 × ? 9. 96 = .096 × ? 11. 550 = 5.5 × ?

8. 75.4 = 7.54 × ? 10. 6.45 = .645 × ? 12. 2.5 = .025 × ?

How Much Does a Carload Weigh?

You can see from the facts below that the average weights of carloads of different kinds of products differ greatly.

Products	Tons	Products	Tons	Products	Tons
Apples	19.61	Cotton (bales)	17.57	Potatoes	20.70
Butter	18.94	Hogs	8.71	Wheat	51.13
Cattle	11.76	Lumber	33.55		
Coal	56.80	Oranges	23.27		

1. A carload of which product weighs the most? Which weighs the least?

2. How much more does a carload of coal weigh than a carload of cotton? of lumber? of oranges? of wheat?

3. How much less does a carload of hogs weigh than a carload of cattle?

4. What is the total weight of 10 carloads of butter? of coal? of cotton? of oranges?

5. What is the total weight of 100 carloads of apples? of hogs? of potatoes? of wheat?

6. Find the total weight of 40 carloads of cattle and 20 carloads of hogs.

7. The heaviest shipment on record was a piece of oil-refining machinery weighing 245 tons. It was shipped on 2 flat cars. What was the average weight carried by each car?

Multiplying a Decimal by a Decimal

1. A passenger train travels at an average speed of 48.6 miles an hour. At that rate how far does it travel in 3.4 hours?

$$\begin{array}{r} 48.6 \\ \times 3.4 \\ \hline 1944 \\ 14580 \\ \hline 165.24 \end{array}$$

Multiply as in multiplying whole numbers.

How much is 486 × 34?

To find where to put the decimal point in the product, estimate the answer. 3 × 48 = 144.

The answer will be a little more than 144. So put the decimal point between the 5 and the 2 in the product.

The train travels 165.24 miles.

2. Use estimation as explained above to tell where to put the decimal points in the products below.

a.	b.	c.	d.	e.
4.3	3.7	3.25	4.36	15.1
2.6	8.9	1.4	3.6	2.04
1118	3293	4550	15696	30804

3. An automobile averages 17.6 miles on a gallon of gasoline. How far does it go on 6.4 gallons of gasoline?

4. Find the products, using the method of estimation explained above.

a.	b.	c.	d.	e.
4.1	2.9	6.37	42.3	36.2
2.3	3.7	2.9	2.5	2.37

We can use multiplication of fractions to check products.

5. Find 4.1 × 2.3. Then find $4\frac{1}{10} \times 2\frac{3}{10}$. Are the products the same?

6. Find 3.9 × 2.7. Check by multiplication with fractions.

7. Find $3\frac{3}{10} \times 2\frac{9}{10}$. Check by multiplication with decimals.

★8. Find the product of $2\frac{7}{10}$ and $4\frac{1}{10}$ in two ways.

7

How to Multiply Any Number by a Decimal

The method explained below of placing the decimal point in the product is used by most people.

1. How much is $\frac{3}{10} \times \frac{9}{10}$? How much is $.3 \times .9$?
   Tenths $\times$ tenths $=$ hundredths, or two decimal places.

2. How much is $\frac{7}{10} \times \frac{46}{100}$? How much is $.7 \times .46$?
   Tenths $\times$ hundredths $=$ thousandths, or three decimal places.

3. How much is 2.48×3.6? (See 2 above.)

$$\begin{array}{r} 2.48 \\ \times\,3.6 \\ \hline 1488 \\ 7440 \\ \hline 8.928 \end{array}$$

A quick way to tell how many places to point off in the product is to count the number of decimal places in the two numbers being multiplied. There are 2 decimal places in 2.48 and 1 decimal place in 3.6. There are 3 decimal places in the two numbers. So point off 3 decimal places in the product.

Show by estimation that 8.928 is a sensible answer.

4. Use the method described above to show how the decimal points are placed in the products below. Check the products by estimation.

a.		b.		c.	
6.3	(1 place)	4.28	(2 places)	34	(0 places)
.4	(1 place)	1.2	(1 place)	1.1	(1 place)
2.52	(2 places)	5.136	(3 places)	37.4	(1 place)

Point off as many decimal places in the product as there are decimal places in the numbers being multiplied. Count from the right.

5. Use this rule. Show that the products are correct.

a.	b.	c.	d.
6.4	2.48	8.64	27.5
1.2	2.1	3.4	1.7
7.68	5.208	29.376	46.75

Placing the Decimal Point in the Product

In the products given below the decimal point is missing. First use the rule given on page 281 to find where to put the decimal point in each product. Then check the answer you get by using estimation as explained on page 280.

	a	b	c	d	e
1.	2.6 1.4 364	.9 .9 81	4.67 4 1868	327 1.2 3924	36.5 4.8 17520
2.	62.5 9.4 58750	275 1.7 4675	6.57 1.5 9855	25.6 .74 18944	25.7 1.2 3084
3.	72.9 6.1 44469	78.1 .20 15620	5.48 1.6 8768	1.38 .4 552	90.6 .43 38958

MORE PRACTICE 366

4. Now copy and work the examples above.

Practice What You Have Learned

	a	b	c	d	e
1.	.8 +.7	9.5 +8.4	37.68 +49.74	4.796 +2.847	$6\frac{3}{4}$ $+7\frac{5}{6}$
2.	.9 −.6	8.4 −2.1	37.63 −28.96	98.962 −87.094	$8\frac{2}{3}$ $-4\frac{3}{4}$
3.	3.1 ×2	4.43 ×18	7.623 ×9	87.92 ×10	$3\frac{1}{2} \times 2\frac{2}{3} =$
4.	1.7 ×2.6	4.85 ×3.9	68.7 ×.87	9.24 ×100	$4\frac{2}{3} \div 2\frac{1}{3} =$

★Multiplying Two Decimal Fractions

1. How much is .3 × .2?

.3 (**1 place**)	
× .2 (**1 place**)	
.06 (**2 places**)	

How many decimal places are there in the two numbers being multiplied?

There must be two decimal places in the product. Because the 6 is 6 hundredths, write a 0 **before** the 6 as a place holder. This keeps 6 in hundredths' place. Put the decimal point before the 0.

We can prove that .06 is correct by multiplying with common fractions. $.2 \times .3 = \frac{2}{10} \times \frac{3}{10} = \frac{6}{100} = .06$.

2. What is the product of .2 × .04?

.04 (**2 places**)	
× .2 (**1 place**)	
.008 (**3 places**)	

To get 3 places in the product, we must write two zeros before the 8. The two zeros keep 8 in thousandths' place.

We can prove that .008 is correct by multiplying with common fractions. $\frac{2}{10} \times \frac{4}{100} = \frac{8}{1000} = .008$.

To get the correct number of decimal places, we write zeros as place holders **before** the products. Then the decimal point will be in the right place.

3. Show that the products below are correct. Check by multiplying with common fractions.

a.	b.	c.	d.	e.
.3	.4	.05	.13	.02
.3	.3	.7	.6	.3
.09	.12	.035	.078	.006

Multiply. Check by multiplying common fractions.

	a	b	c	d
4.	.3 × .7 =	.2 × .2 =	.4 × .01 =	.3 × .2 =
5.	.4 × .2 =	.5 × .01 =	.3 × .06 =	.5 × .08 =
6.	.9 × .13 =	.4 × .09 =	.04 × .3 =	.9 × .37 =

MORE PRACTICE 366

"Down Where the Tall Corn Grows"

1. The Department of Agriculture reports that 12.5 bushels of corn produce 100 pounds of pork. How many bushels of corn are needed to produce 200 pounds of pork?

2. A bushel of corn weighs 56 pounds. How many pounds of corn are there in 12.5 bushels?

3. How many more pounds of corn are needed to produce 100 pounds of pork than the pork itself weighs?

4. About .6 of the weight of a hog is pork. How much pork would be secured from a 225-pound hog?

5. Recently, at a stock show, a 225-pound prize hog was sold at \$8.84 a pound. How much was received for the hog?

6. On the same day, \$.28 a pound was paid for hogs at a near-by stockyard. How much would be received for a 225-pound hog at that rate?

7. A good worker can pick and husk about $1\frac{3}{4}$ acres of corn a day. A corn-picking machine can pick at least 12 times as many acres a day. How many acres is this?

★8. The prices received by farmers for a bushel of corn were \$.52 in 1938 and \$2.46 in 1948. How much more did a farmer receive for $12\frac{1}{2}$ bushels of corn in 1948 than in 1938?

What's Wrong Here?

Find and correct the errors in the examples below.

1.	2.	3.	4.
$\begin{array}{r} 27.8 \\ \times 9.6 \\ \hline 166\ 4 \\ 2466\ 0 \\ \hline 2632.4 \end{array}$	$\begin{array}{r} 3.48 \\ \times 2.4 \\ \hline 13\ 92 \\ 68\ 60 \\ \hline 81.52 \end{array}$	$\begin{array}{r} .9 \\ \times 6 \\ \hline .56 \end{array}$	$\begin{array}{r} 40.7 \\ \times 208 \\ \hline 3254 \\ 8140 \\ \hline 11394 \end{array}$

Practice in Multiplication of Decimals

	a	b	c	d
1.	$7 \times .1 =$	$3 \times .03 =$	$4 \times .002 =$	$6 \times .5 =$
2.	$6 \times 2.4 =$	$9 \times 7.48 =$	$.7 \times 80 =$	$8 \times .58 =$
3.	$8 \times .02 =$	$.3 \times .2 =$	$.3 \times .04 =$	$.5 \times .7 =$
4.	$.6 \times .25 =$	$.5 \times 1.98 =$	$.3 \times 2.7 =$	$.6 \times .46 =$
5.	$1.6 \times 1.7 =$	$.37 \times 82.4 =$	$.6 \times .09 =$	$.7 \times .03 =$
6.	$10 \times 24.75 =$	$100 \times 3.168 =$	$1000 \times 2.6 =$	$10 \times .368 =$
7.	$1.2 \times .75 =$	$.18 \times 18.7 =$	$2.4 \times 238 =$	$4.9 \times 67.8 =$
8.	$3.5 \times 1.84 =$	$7.8 \times 90.6 =$	$1.69 \times 43.5 =$	$2.5 \times 3.58 =$
9.	$.92 \times 79.6 =$	$5.4 \times 76.9 =$	$2.76 \times 83.5 =$	$.38 \times 46.1 =$

MORE PRACTICE 367

Practice What You Have Learned

	a	b	c	d	e
1.	$4\frac{1}{4} + 5\frac{2}{3} =$	$6\frac{1}{8} - 3\frac{3}{4} =$	$74 \times 3\frac{1}{2} =$	$\frac{3}{4}$ of $72 =$	$24\frac{1}{4} \times 7 =$
2.	$\frac{3}{4} \times \frac{5}{6} =$	$1\frac{1}{2} \times \frac{2}{3} =$	$8 \times 3.75 =$	$20 \times 2.683 =$	$4\frac{1}{2} \times 3\frac{1}{3} =$
3.	$\frac{3}{4} \div \frac{1}{2} =$	$4\frac{1}{2} \div \frac{3}{4} =$	$2\frac{1}{2} \div 3\frac{1}{3} =$	$6 \div 1\frac{1}{3} =$	$7\frac{1}{2} \div 5 =$
4.	$\begin{array}{r} 2.5 \\ \times 1.6 \\ \hline \end{array}$	$\begin{array}{r} 9.78 \\ +6.59 \\ \hline \end{array}$	$\begin{array}{r} 74.583 \\ -69.894 \\ \hline \end{array}$	$25\overline{)12,175}$	$49\overline{)4165}$
5.	$\begin{array}{r} 3.7 \\ \times 2.6 \\ \hline \end{array}$	$\begin{array}{r} 8.75 \\ \times 3.8 \\ \hline \end{array}$	$\begin{array}{r} 3.674 \\ \times 45 \\ \hline \end{array}$	$\begin{array}{r} .895 \\ \times 79 \\ \hline \end{array}$	$\begin{array}{r} 9.64 \\ \times 6.8 \\ \hline \end{array}$

6. $9,784 + 653 + 86,052 + 508,799 =$

7. $\$27.52 + \$3 + \$.80 + \$978.94 =$

Diagnostic Test in Multiplication of Decimals

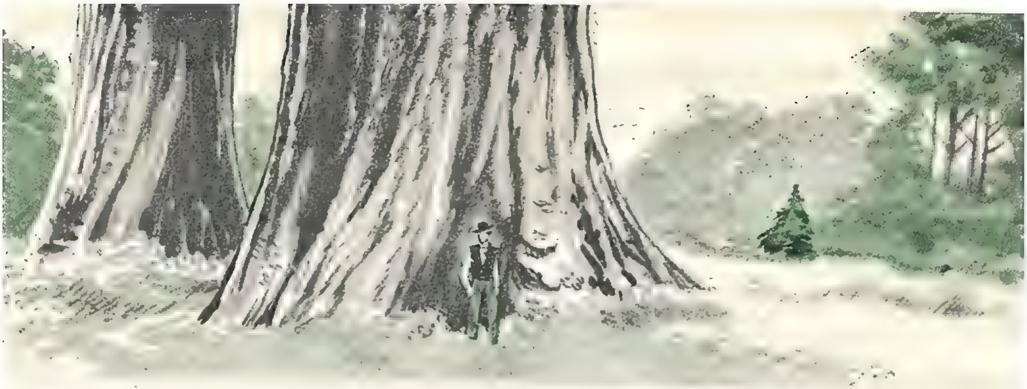
	a	b	c	
1.	2 × 3.2 =	4 × 7.6 =	5 × .3 =	(274)
2.	4 × 1.26 =	5 × 3.68 =	7 × .48 =	(275)
3.	9 × 3.648 =	8 × .796 =	6 × 3.974 =	(275)
4.	10 × 3.74 =	100 × 56.8 =	1000 × 2.69 =	(278)
5.	1.6 × 2.4 =	1.2 × 3.67 =	3.04 × 20.3 =	(281)
6.	.2 × .3 =	.4 × .13 =	.9 × .02 =	(283)

For help, turn to the page given at the right.

★Interesting Topics to Look Up

If you have no work to correct, look up one of the topics below.

1. Local rates for water, electricity, and gas.
2. Safety instruments used on airplanes.
3. Why ice floats.
4. How many miles an hour a spot on the equator moves.
5. The amount of water in fruits and vegetables.
6. The thermometer the doctor uses.
7. How the speed of the wind is measured.
8. What information is given on a weather map.
9. The sizes of automobile tires.
10. The scales to which maps are drawn.
11. How to locate places on a road map.
12. How to find the distance around a bicycle tire.
13. How the weatherman uses the barometer.
14. Decimals used in reference books.



★How Large Are Our Trees?

1. The **diameter** (thickness) of a tree is approximately $\frac{7}{22}$ of its **circumference** (distance around the trunk of the tree). Bob found that the circumference of a tree near his home was 66 inches. How many inches was the diameter of this tree?

Think: How much is $\frac{7}{22}$ of 66 inches?

2. The circumference of one of the large sequoia trees of California is 165 feet. What is the diameter of the tree? Would the tree fit into an area the size of your classroom?

3. The diameter of another sequoia tree is 70 feet. What is its circumference?

Think: The diameter $= \frac{7}{22}$ of the circumference.

70 ft. $= \frac{7}{22}$ of how many feet?

4. Long ago there was a tree in Sequoia Park that was 450 feet high. How much less than $\frac{1}{8}$ mile was its height?

5. Describe methods that can be used to measure the circumference of a tree.

6. Measure the circumference of a tree or post. Then find its diameter, using the method given in problem 1.

7. Measure the circumference of a large can of fruit. Next find the diameter of the can as explained above. Then measure the diameter of the bottom of the can with a ruler. Do your results check?

Test in Multiplication of Decimals

1. 3.4	2. .49	3. .46	4. 59.6	5. 1.485
2	4	.7	46	87

6. 3.6	7. 3.8	8. 974	9. 2.74	10. 4.896
1.2	.95	3.8	10	1000

★How the Egyptians Multiplied

To multiply, the Egyptians used a method called doubling or **duplication.** To multiply 18 × 32, they proceeded as shown at the left below.

A	B
1	32
2	64
4	128
8	256
16	512

a. The top number under A is 1. Notice that each number in A below the 1 is double the number above it.

b. The top number under B is 32, the number being multiplied. Notice that each number below the 32 is double the number above it.

c. Because 18 = 16 + 2, to find the product of 18 × 32, add the 64 and 512 under B. Their sum is 576, which is the product of 18 × 32. Multiply 18 × 32 in the usual way to check this answer.

1. Use the above lists to find 19 × 32.
   Hint: 19 = 16 + 2 + 1.

2. Use the above lists to find 23 × 32.

3. Continue the doubling of the numbers under A and B above. You can use the lists to find the product of 32 multiplied by larger numbers. Find 49 × 32 in this way.

4. Use the Egyptian method to find the products below. Check each answer by multiplying the numbers.

a. 18 × 27 =   b. 25 × 48 =   c. 31 × 72 =

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	5.846 .097 .859	$64.58 9.85 .06	95.3 825.6 87.8	$6\frac{1}{4}$ $4\frac{3}{4}$ $2\frac{1}{2}$	3′ 8″ 4′ 6″ 2′ 7″
2.	$7\frac{1}{2}$ $6\frac{1}{4}$ $4\frac{1}{8}$	$6\frac{3}{4}$ $5\frac{1}{3}$ $6\frac{1}{3}$	$7\frac{1}{5}$ $6\frac{1}{2}$ $8\frac{2}{5}$	.06 .08 .05	6 lb. 4 oz. 7 lb. 2 oz. 9 lb. 12 oz.

Practice Test in Subtraction

1.	7010 2040	$40.05 20.76	38.275 24.465	85.3 25.3	6′ 4″ 2′ 8″
2.	24 $12\frac{1}{2}$	$6\frac{2}{3}$ $\frac{2}{3}$	$14\frac{1}{4}$ $7\frac{3}{4}$	$6\frac{1}{2}$ $4\frac{7}{8}$	$4\frac{3}{4}$ $2\frac{5}{6}$

Practice Test in Multiplication

1.	3.842 3	8.1 5.6	16.5 .37	36 $4\frac{3}{4}$	3 gal. 1 qt. 5

2. $\frac{2}{3} \times \frac{3}{4} =$ $\quad 6 \times 2\frac{2}{3} =$ $\quad \frac{1}{4}$ of $3\frac{1}{3} =$ $\quad .9$ of $8.9 =$ $\quad 3\frac{3}{8} \times \frac{5}{6} =$

Practice Test in Division

	a	b	c	d
1.	9)7564	75)3525	16)8752	29)25,648
2.	47)13,912	85)26,180	94)37,788	2)3 hr. 30 min.
3.	$6 \div 1\frac{1}{2} =$	$1\frac{1}{4} \div 5 =$	$\frac{2}{3} \div \frac{3}{4} =$	$7\frac{1}{2} \div 2\frac{3}{4} =$

Checking on Important Points

1. Give the place value of each figure in 384.596.

2. Write the smallest possible three-place decimal fraction.

3. Arrange in order of their size, placing first the number with the smallest value: .27, .4, 3, .068.

4. Show by changing .3 and .4 to common fractions that the product of .3 × .4 is hundredths.

5. How many decimal places must you point off in the product of 4.26 × 3.8? Find the product.

6. How many times the value of the 3 in 4.3 is the value of the 3 in 3.6?

7. What is the product when you multiply 4.36 by 10? by 100? Use the short method. Check, using the long method.

8. Multiply. Use estimation to check the products.

a.	b.	c.	d.
$\begin{array}{r} 3.48 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 4.2 \\ \times 2.8 \\ \hline \end{array}$	$\begin{array}{r} 3.684 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 2.45 \\ \times 36.7 \\ \hline \end{array}$

9. How many ounces are there in 3.5 pounds?

10. Why must the product of .2 × .8 be less than 1?

11. How can you tell that the answer of $\frac{7}{8} \div \frac{2}{3}$ is greater than 1?

12. Find the area of a farm 1.5 miles long and .8 miles wide.

13. What is wrong here: .3 × .8 = 2.4?

14. How much is 24 − 2.65?

Progress Test VIII

1. (180) $874.5 + 963.7$	2. (180) $8.936 - 2.487$	3. (139) $\$9.84 \times 709$	4. (55) $28\overline{)25,368}$
5. (100) $7\frac{5}{6} + 4\frac{1}{2}$	6. (111) $6\frac{1}{4} - 3\frac{1}{2}$	7. (200) $6\frac{1}{2} \times 8$	8. (152) 6 ft. 4 in. − 2 ft. 8 in.
9. $\frac{1}{2}\times\frac{1}{4}=$ (208)	10. $5\times2\frac{3}{4}=$ (200)	11. $2\frac{1}{2}\times\frac{4}{5}=$ (223)	12. $6\frac{2}{3}\times4\frac{1}{2}=$ (225)
13. $5\div2\frac{1}{2}=$ (236)	14. $1\frac{1}{2}\div3=$ (248)	15. $\frac{1}{2}\div\frac{1}{3}=$ (237)	16. $2\frac{1}{2}\div1\frac{2}{3}=$ (239)
17. (274) 7.8×6	18. (275) 3.64×85	19. (281) 53.6×4.7	20. (283) $.28 \times .2$

For help, turn to the page given under the number of the example.

★Special Work to Do

1. Look up the terms below. Be ready to tell what they mean.

account	centimeter	furlong	net weight
avoirdupois	C. O. D.	gain	profit
bank check	cord (of wood)	gill	receipts
capacity	fathom	long ton	retail
carat	fluid ounce	loss	wholesale

2. Find the standard weight of a bushel of each of the following:

apples wheat tomatoes potatoes corn

3. Make a list of units used in measuring the following:

weight area distance time liquids

Test in Problem Solving VIII

1. Tom is paid 40 cents an hour for helping at the store. How much does he earn in $3\frac{1}{2}$ hours?

2. What is the area of a garden that is 50 feet long and 3 feet wide?

3. If 4 doughnuts cost 15 cents, how much do a dozen doughnuts cost?

4. At an average speed of 5.24 miles a minute, how far does an airplane fly in an hour?

5. How many pounds do 8 bags of candy weigh if each bag weighs 12 ounces?

6. Find the perimeter of a table that is 4.5 feet long and 3.6 feet wide.

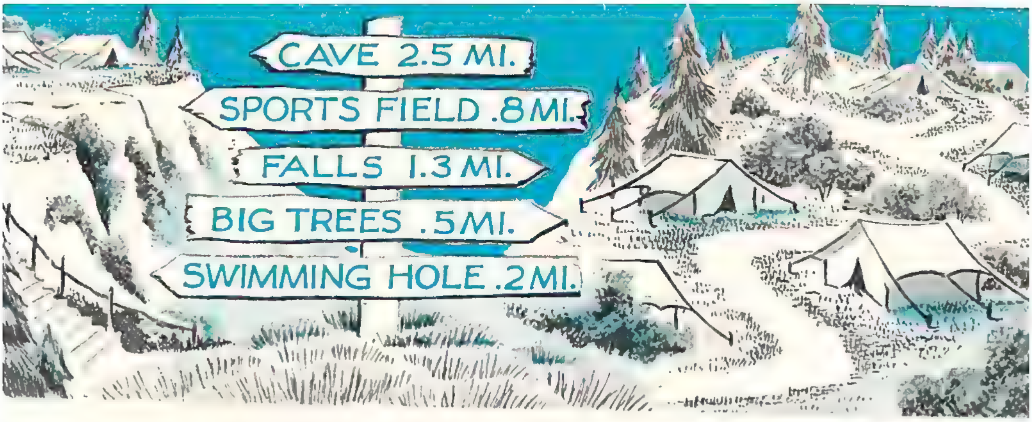
7. Ann paid 20¢ for $\frac{1}{4}$ yard of ribbon. What was the price of the ribbon a yard?

8. If 3 candy bars cost 10 cents, how many bars can you buy for 40 cents?

9. Mrs. Smith buys $3\frac{3}{4}$ yards of cloth at $1.20 a yard. How much change should she receive from a $5 bill?

10. The Smith family uses on the average .75 pound of butter a day. At that rate what is the cost of the butter for a week at $.80 a pound?

Did you beat your score on the last test?



CHAPTER IX

"Let's Go"

The signs show the distances from a summer camp to several interesting places near by. Use the signs to answer the questions below. Notice the directions in which the signs point.

1. Which of the places shown above is farthest from the camp? Which of the places is nearest the camp?

2. How much farther from the camp is the cave than the sports field?

3. How much nearer the camp is the swimming hole than the sports field?

4. How much farther is it from the camp to the cave than from the camp to the falls?

5. What is the distance from the sports field to the falls?

6. How far is it from the big trees to the sports field?

7. A hiking club walked from the camp to the falls and back in the morning. They hiked to the cave and back in the afternoon. What was the total distance?

8. The post office in a near-by village was 1.5 miles beyond the falls. How far was it from the camp to the post office?

★ 9. How does a compass help us to tell directions?

Are You Ready for Division of Decimals?

Division of decimals is much like division of money.

I. Dividing dollars and cents by a whole number

1. In which of the following examples will the quotient be more than \$1.00? less than \$1.00? less than \$.50? How can you tell?

a. $6\overline{)\$8.70}$ b. $9\overline{)\$1.62}$ c. $25\overline{)\$24.75}$ d. $8\overline{)\$.68}$

2. Copy and divide. Check your answers.

II. Dividing dollars and cents by cents

1. How many cents are there in \$1.25? in \$.50? in \$.05?

2. How many pencils at \$.05 each can you buy for \$.50?

Explain why $\$.05\overline{)\$.50}$ and $5\overline{)50}$ give the same answer.

3. Find the quotients in the following. Check.

a. $\$.05\overline{)\$1.50}$ b. $\$.25\overline{)\$.75}$ c. $\$.36\overline{)\$1.08}$ d. $\$.12\overline{)\$14.48}$

III. Dividing dollars by cents

1. At \$.10 each how many tickets can you buy for \$2? Why must you express \$2 as \$2.00?

2. Find the quotients of the following. Check.

a. $\$.05\overline{)\$4.00}$ b. $\$.20\overline{)\$5}$ c. $\$.75\overline{)\$6}$ d. $\$.15\overline{)\$18}$

IV. Multiplying by 10 and 100

Multiply each of the numbers below by 10; by 100.

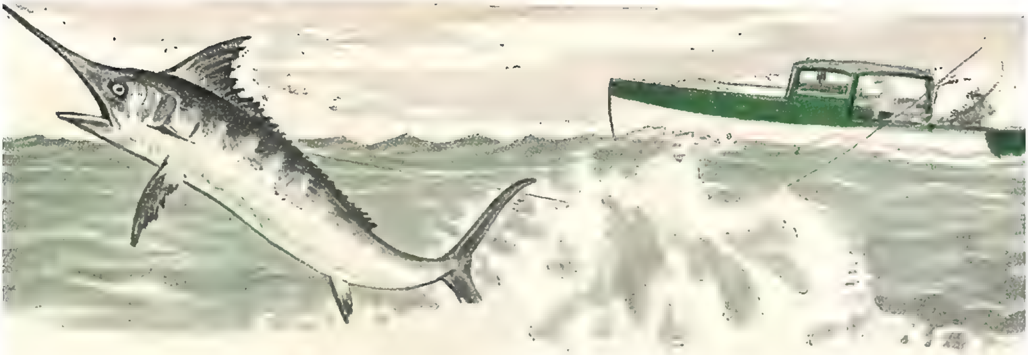
a. .7 b. 1.6 c. .25 d. 37.5 e. 2.684 f. 28.4

If you have difficulty, review page 278.

V. Dividing by common fractions

Change the decimal fractions below to common fractions, and find the answers to the examples.

a. $.6 \div .3 =$ b. $1.5 \div .5 =$ c. $3.41 \div 1.1 =$



How Would You Like to Catch One?

Recent records for salt water fish caught with rod and reel:

Fish	Weight	Length	Girth
Marlin	976 lb.	12′8″	6′2″
Shark	1919 lb.	14′8″	8′$\frac{1}{2}$″
Swordfish	860 lb.	13′9″	5′10″
Tuna	927 lb.	10′3″	6′8″

1. Which of these fish was the heaviest? How much less than a ton did it weigh?

2. How much more did the marlin weigh than the tuna? How much longer was it? How much less was its girth?

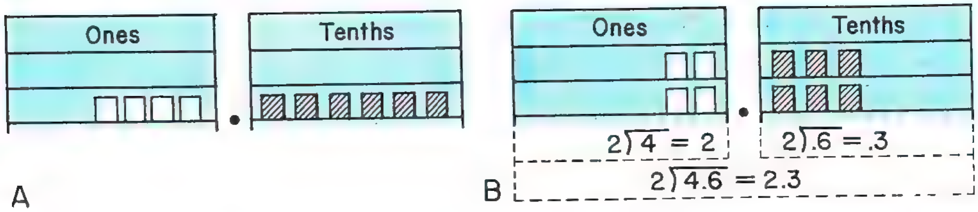
3. How much longer was the swordfish than the marlin? How much less was its girth?

Recent records for fresh water fish are as follows:

Fish	Weight	Length	Girth
Black bass	22 lb. 4 oz.	$32\frac{1}{2}$ in.	$28\frac{1}{2}$ in.
Muskellunge	64 lb. 8 oz.	58 in.	24 in.
Northern pike	46 lb. 2 oz.	$52\frac{1}{2}$ in.	25 in.
Walleyed pike	22 lb. 4 oz.	$36\frac{1}{4}$ in.	21 in.

4. How much more was the weight of the muskellunge than of the northern pike? How much more was its length?

★5. Express as feet and inches the lengths of the four fish; their girths.



Dividing a Decimal by a Whole Number

1. Let us use the drawings to find $2\overline{)4.6}$.
What number do you see in A?
How is 4.6 regrouped in B? How large is each group?

$\begin{array}{r} \mathbf{2.3} \\ \mathbf{2\overline{)4.6}} \end{array}$ In the example, divide as with whole numbers. First, divide the ones; then, the tenths.
$2\overline{)4} = 2$; $2\overline{).6} = .3$. The quotient is 2.3.

The 6 in 4.6 is 6 tenths. So the 3 in the quotient must be tenths. Since $2\overline{)4}$ is 2, we know that 2.3 is a sensible answer.
How much is 2×2.3? Show that $4\frac{6}{10} \div 2 = 2\frac{3}{10}$.

2. How can you tell that the quotients in the examples below are all placed correctly? Use division with common fractions to show that the quotients are correct. Check the answers by multiplication as shown in problem 1.

a. $\begin{array}{r} 4.1 \\ 6\overline{)24.6} \end{array}$ b. $\begin{array}{r} .3 \\ 5\overline{)1.5} \end{array}$ c. $\begin{array}{r} 6.9 \\ 4\overline{)27.6} \end{array}$ d. $\begin{array}{r} .2 \\ 3\overline{).6} \end{array}$ e. $\begin{array}{r} 1.5 \\ 4\overline{)6.0} \end{array}$

MORE PRACTICE

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3. Tell where the decimal points should be placed in the quotients below. Check by multiplication.

a. $\begin{array}{r} 4 \\ 4\overline{)1.6} \end{array}$ b. $\begin{array}{r} 52 \\ 5\overline{)26.0} \end{array}$ c. $\begin{array}{r} 162 \\ 4\overline{)64.8} \end{array}$ d. $\begin{array}{r} 2 \\ 4\overline{).8} \end{array}$ e. $\begin{array}{r} 1052 \\ 3\overline{)315.6} \end{array}$

Divide and check.

	a	b	c	d	e
4.	$5\overline{)67.5}$	$4\overline{)3.6}$	$7\overline{)21.7}$	$3\overline{)60.9}$	$2\overline{)300.4}$
5.	$2\overline{).8}$	$3\overline{)1.8}$	$6\overline{)5.4}$	$9\overline{)38.7}$	$6\overline{)36.0}$

Dividing Other Decimals by Whole Numbers

1. John's brother earns \$12.40 a day. If he works 8 hours a day, how much is he paid an hour?

$$\begin{array}{r} \$1.55 \\ 8\overline{)\$12.40} \\ 8\;\;\;\;\; \\ \hline 4\,4\;\; \\ 4\,0\;\; \\ \hline 40 \\ 40 \\ \hline \end{array}$$

Here we are dividing dollars and hundredths of a dollar. Because we are dividing hundredths by a whole number, the quotient must show hundredths. You can see that \$1.55 is a sensible answer because $8\overline{)12}$ is a little more than 1.

How much is $8 \times \$1.55$? How much is $12\frac{40}{100} \div 8$?

2. Check the answers below by estimation and multiplication, as in problem 1. Show that the decimal points in the quotients are correctly placed.

a. $\begin{array}{r} 1.92 \\ 3\overline{)5.76} \end{array}$ b. $\begin{array}{r} 7.21 \\ 7\overline{)50.47} \end{array}$ c. $\begin{array}{r} 2.162 \\ 4\overline{)8.648} \end{array}$ d. $\begin{array}{r} .491 \\ 4\overline{)1.964} \end{array}$

3. Tell where to place the decimal point in the quotient when you divide a decimal by a whole number. Susie said, "Place the decimal point in the quotient directly above the decimal point in the number being divided." Was she right?

Divide. Check your answers by estimation and multiplication.

	a	b	c	d	e
4.	$4\overline{)13.68}$	$8\overline{)44.08}$	$3\overline{)9.27}$	$5\overline{)6.75}$	$4\overline{)67.28}$
5.	$9\overline{)87.48}$	$2\overline{)3.756}$	$6\overline{)5.706}$	$4\overline{)3.984}$	$6\overline{)4.866}$
6.	$4\overline{)167.52}$	$9\overline{)134.001}$	$4\overline{).72}$	$5\overline{)4.575}$	$2\overline{)19.52}$
7.	$25\overline{)9.125}$	$45\overline{)94.95}$	$28\overline{)142.8}$	$12\overline{)1.572}$	$36\overline{)308.52}$

MORE PRACTICE 368

★Budget for a Camping Trip

A group of ten boys wanted to find the cost of the food for a 10-day camping trip. The table shows the food budget for one day for one boy.

Daily Budget for One Boy	
Vegetables	24¢
Milk and cheese	28¢
Fruit	16¢
Meat and eggs	45¢
Bread and cereal	32¢
Other groceries	30¢
Total	?

1. What is the total of the daily food budget for one boy?

2. How much would the total food budget be for one boy for a 10-day camping trip?

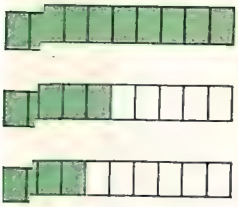
3. How much would be the total food budget for the 10 boys for one day? How much for 10 days?

4. How much would the budget for vegetables be for one boy for the 10-day trip? How much for the 10 boys?

5. Find the total budget for the 10 boys for the 10-day trip for meat and eggs. How much more was this than for bread and cereal?

6. John's mother said, "You should allow $\frac{1}{5}$ of your budget for bread and cereal. You should allow $\frac{1}{5}$ or more for milk and cheese, and $\frac{1}{5}$ or less for meat and eggs." How much is $\frac{1}{5}$ of the daily budget? For which foods had the boys allowed too little? too much? about the right amount?

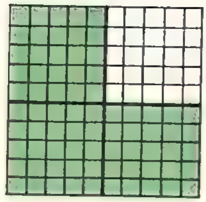
7. If possible, find how much is allowed for food for each person in your home for a month.



$1 = \frac{10}{10}$, or 1.0

$\frac{1}{2} = \frac{5}{10}$, or .5

$\frac{2}{5} = \frac{4}{10}$, or .4

B 

$1 = \frac{100}{100}$, or 1.00

$\frac{1}{4} = \frac{25}{100}$, or .25

$\frac{3}{4} = \frac{75}{100}$, or .75

Changing Common Fractions to Decimal Fractions

1. Use A to find the missing numerators: $\frac{1}{2} = \frac{?}{10}$; $\frac{2}{5} = \frac{?}{10}$. Express $\frac{1}{2}$ and $\frac{2}{5}$ as decimal fractions.

2. Find the missing numerators: $\frac{1}{4} = \frac{?}{100}$; $\frac{3}{4} = \frac{?}{100}$; $\frac{3}{8} = \frac{?}{1000}$. Express $\frac{1}{4}$, $\frac{3}{4}$, and $\frac{3}{8}$ as decimal fractions.

3. Change $\frac{1}{2}$ to a decimal fraction.

A. $\frac{1}{2} = 2\overline{)1}$

B. $2\overline{)1.0}$ with quotient .5

1.0

We know that $\frac{1}{2} = 2\overline{)1}$. We cannot divide 1 as a one by 2. 1 whole $= \frac{10}{10}$, or 1.0. Change the 1 in A to 1.0 by placing a decimal point after the 1. Then write a zero after the decimal point. Now divide as shown in B.

4. Change $\frac{1}{4}$ to a decimal fraction.

A. $\frac{1}{4} = 4\overline{)1}$

B. $4\overline{)1.00}$ with quotient .25

8×

20

20

We cannot divide 1 as a one by 4. We know that $1 = \frac{100}{100}$ or 1.00. When we **annex** (write after) one zero to the 1 and divide, there is a remainder. When we annex two zeros to the 1 and divide, as in B, is there a remainder?

5. Use this method to change $\frac{3}{4}$ to a decimal fraction.

6. Change $\frac{3}{8}$ to a decimal fraction. How many zeros must we annex to 3 before there is no remainder? Does 3.000 = 3?

$.3\frac{3}{4}$	$.37\frac{1}{2}$	.375
$8\overline{)3.0}$	$8\overline{)3.00}$	$8\overline{)3.000}$
2 4	2 4×	2 4××
6	60	60
	56	56
	4	40
		40

Change to decimal fractions:

7. $\frac{1}{5}$; $\frac{3}{5}$; $\frac{4}{5}$; $\frac{4}{20}$

8. $\frac{5}{20}$; $\frac{7}{25}$; $\frac{19}{50}$; $\frac{12}{50}$

9. $\frac{1}{8}$; $\frac{5}{8}$; $\frac{6}{48}$; $\frac{3}{16}$

Incomplete Decimals

$$3\overline{)1.0}\quad .3\tfrac{1}{3}$$
$$3\overline{)1.00}\quad .33\tfrac{1}{3}$$
$$3\overline{)1.000}\quad .333\tfrac{1}{3}$$

In changing $\frac{1}{3}$ to a decimal fraction, there is a remainder no matter to how many places we carry the work.

We call $.3\frac{1}{3}$, $.33\frac{1}{3}$, and $.333\frac{1}{3}$ **incomplete decimals.** We usually say that $\frac{1}{3} = .33\frac{1}{3}$.

Change to three-place incomplete decimals:

1. $\frac{2}{3}$; $\frac{1}{6}$; $\frac{5}{6}$; $\frac{4}{9}$
2. $\frac{7}{15}$; $\frac{4}{11}$; $\frac{3}{7}$; $\frac{7}{12}$

Using Decimal Fractions in Quotients

1. Grace had 7 pounds of candy. She divided it into 4 equal parts. How many pounds were there in each part?

A.
$$\begin{array}{r} 1\frac{3}{4} \\ 4\overline{)7} \\ \underline{4} \\ 3 \end{array}$$

B.
$$\begin{array}{r} 1.75 \\ 4\overline{)7.00} \\ \underline{4\ \ \ \ } \\ 3\ 0\ \ \\ \underline{2\ 8\ \ } \\ 20 \\ \underline{20} \end{array}$$

The work in A shows that there should be $1\frac{3}{4}$ pounds in each part.

In B we carry the work to two decimal places. Show that $1\frac{3}{4}$ and 1.75 are equal.

Because there is no remainder, the work is complete.

2. Suppose Grace divides the 7 pounds into 2 equal parts. How many pounds should there be in each part?

A. $2\overline{)7}$ with quotient $3\frac{1}{2}$ B. $2\overline{)7.0}$ with quotient 3.5

Express the quotients below as mixed numbers and as mixed decimals. Carry the work to two decimal places.

	a	b	c	d	e
3.	$2\overline{)9}$	$5\overline{)8}$	$8\overline{)14}$	$15\overline{)48}$	$2\overline{)13}$
4.	$4\overline{)15}$	$16\overline{)84}$	$8\overline{)42}$	$4\overline{)13}$	$12\overline{)39}$
5.	$20\overline{)148}$	$10\overline{)175}$	$6\overline{)15}$	$24\overline{)492}$	$12\overline{)30}$

MORE PRACTICE 368

Rounding Off Decimals

1. In a recent race, a motorboat traveled at a speed of 124.915 miles an hour. How many miles was this a minute to the nearest hundredth of a mile?

$$\begin{array}{r} 2.081 \\ 60\overline{)124.915} \\ \underline{120\ ^{\times\times\times}} \\ 4\,91 \\ \underline{4\,80} \\ 115 \\ \underline{60} \\ 55 \end{array}$$

In this example there is a remainder after the division has been carried to three decimal places. We can round off the answer by dropping the last figure in the quotient. Thus the speed was 2.08 miles a minute, correct to the nearest hundredth of a mile. 2.081 is closer to 2.08 than to 2.09. To the nearest tenth of a mile, the speed was 2.1 miles. 2.08 is closer to 2.1 than to 2.0.

2. What was the speed a minute to the nearest mile?

3. Show that the speed of the motorboat was 124.9 miles an hour to the nearest tenth of a mile. Show that its speed was 125 miles to the nearest mile.

This is how to round off a quotient.

(1) Carry the work to one more place than is to be kept in the answer.

(2) If the last figure is 5 or more, increase by one the next figure to the left.

(3) If the last figure is less than 5, drop it.

4. Apply these rules to the work at the top of the page.

5. Round off each of the following to the nearest tenth:

8.41 9.46 47.28 64.55 93.021 6.452

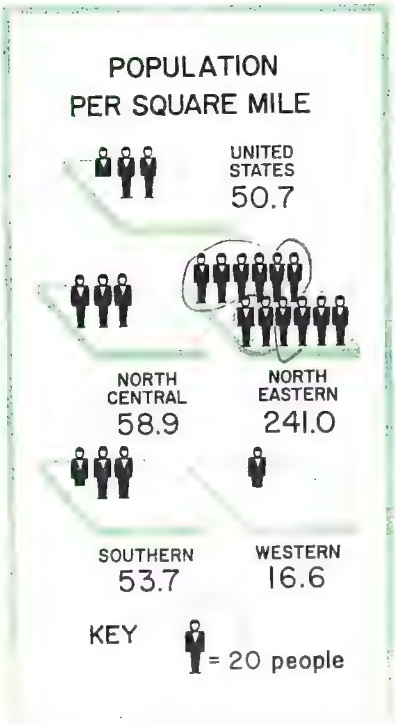
6. Round off the numbers to the nearest whole number.

7. Round off each number below, first to the nearest hundredth; then to the nearest tenth; then to the nearest one.

4.628 23.575 8.742 3.051 9.256

8. Round off the quotients to the nearest hundredth:

a. $12\overline{)86.978}$ b. $46\overline{)97.473}$ c. $25\overline{)86.748}$ d. $59\overline{)379.685}$



Is Our Country Crowded?

The diagram shows the number of people per square mile in different parts of the United States. The number is shown in two ways.

1. Which **symbol** (picture) is used in the diagram to represent 20 people? How many people does $\frac{1}{4}$ of this symbol represent?

2. In which part of the United States are there more than 200 people per square mile? How do the symbols help you to tell? Why can you not give an accurate number, using only the symbols shown above?

3. Use the symbols to tell in what section there are more than 10 but less than 20 persons per square mile.

4. Now use the numbers given in the diagram. How much more is the density of population in the northeastern states than in the southern states? than in the north central states? than in the western states?

5. Allow 4 persons for a home. What is the approximate number of homes needed to house the average number of persons per square mile in the United States? in the southern states? in the northeastern states? in the north central states? in the western states?

6. How many people would there be in an area 10 miles long and 10 miles wide in each section?

★7. Look up the density of the population of Japan and Australia.

Rounding Off in Division

In the examples below carry the work to two decimal places. Round off the answers to the nearest tenth.

	a	b	c	d
1.	$29\overline{)63}$	$36\overline{)314}$	$12\overline{)191}$	$16\overline{)247}$
2.	$15\overline{)16.4}$	$87\overline{)842.2}$	$28\overline{)88}$	$18\overline{)134.4}$
3.	$12\overline{)19.84}$	$47\overline{)92.648}$	$40\overline{)85}$	$64\overline{)245}$

In the examples below round off the quotients to the nearest hundredth. To how many places must you carry the work?

	a	b	c	d
4.	$23\overline{)49.72}$	$12\overline{)40}$	$18\overline{)26.04}$	$30\overline{)50}$
5.	$24\overline{)570}$	$14\overline{)23.2}$	$64\overline{)72}$	$70\overline{)110}$
6.	$53\overline{)62.3}$	$89\overline{)164.01}$	$8\overline{)3.741}$	$4\overline{)9.537}$

MORE PRACTICE 368

★7. On a 161-mile trip, Mr. Jones used 12 gallons of gasoline. To the nearest mile how many miles did he average to the gallon?

Practice What You Have Learned

	a	b	c	d	e
1.	$8\overline{)36.8}$	$8\overline{)21}$	$5\overline{)36.4}$	$4\overline{)17.4}$	$2\overline{)3.9}$
2.	$4\overline{)29}$	$8\overline{)3.4}$	$24\overline{)54}$	$6\overline{)9}$	$12\overline{)18}$
3.	$6\overline{)39.72}$	$15\overline{)7.2}$	$25\overline{)12.675}$	$16\overline{)33.28}$	$48\overline{)86.4}$
4.	$7\times3.65=$	$9\times8.3=$	$.4\times.3=$	$2.1\times6=$	$.02\times4=$
5.	$48\times3\frac{3}{4}=$	$7\frac{1}{2}-4\frac{3}{4}=$	$\frac{1}{2}\div\frac{3}{4}=$	$7\frac{5}{6}+4\frac{3}{4}=$	$3\frac{3}{4}\times3\frac{1}{5}=$

Checking Up on Multiplication of Decimals

Multiply and check your work.

	a	b	c	d
1.	$2 \times .8 =$	$2 \times 1.4 =$	$3 \times 4.8 =$	$5 \times 63.8 =$
2.	$4 \times .16 =$	$5 \times 2.76 =$	$6 \times .498 =$	$9 \times 7.583 =$
3.	$10 \times 1.4 =$	$10 \times 6.58 =$	$100 \times .568 =$	$1000 \times 1.963 =$
4.	$2.6 \times 1.4 =$	$.8 \times 3.87 =$	$4.37 \times 12.4 =$	$3.8 \times 64.8 =$
5.	$.3 \times .3 =$	$.6 \times .04 =$	$.3 \times .02 =$	$.04 \times .6 =$

★A Shorter Method of Multiplying Numbers

A.	B.
423	423
×267	×267
2961	2961
25380	2538
84600	846
112941	112941

1. How is the work in A different from the work in B? Notice that in B the 0 is not written in ones' place when we multiply 3 by 6 tens. Instead we write the 8 of 3×6 under the 6 in tens' place. In B we do not write 0's in ones' or tens' places when we multiply 3 by 2 hundreds. There are fewer figures in B.

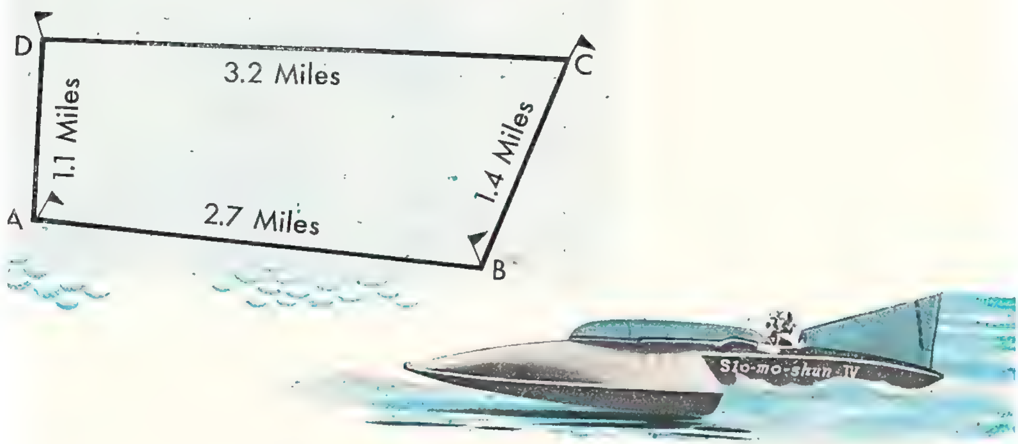
2. How is the work in the pairs of examples below different?

a.		b.	
372	372	348	348
×26	×26	×207	×207
2232	2232	2436	2436
7440	744	69600	696
9672	9672	72036	72036

Which method do you prefer?

Use the method explained above to find the products:

	a	b	c	d
3.	$48 \times 397 =$	$59 \times 682 =$	$67 \times 364 =$	$23 \times \$7.94 =$
4.	$376 \times 582 =$	$384 \times 214 =$	$195 \times 794 =$	$632 \times \$6.85 =$
5.	$905 \times 4135 =$	$870 \times 5685 =$	$3607 \times 5917 =$	$3620 \times \$51.32 =$



Motorboat Races

1. The map above shows the distances between the flags on a motorboat racecourse. Find the total length of the course which starts at flag A.

2. How much farther is it from C to D than from A to B?

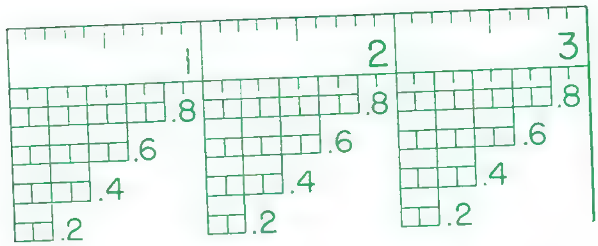
3. What is the total length of a race that is four times around the whole course?

4. A motorboat travels at an average speed of 30 miles an hour. How many minutes would it take a motorboat to go from A to B? from B to C? from C to D? from D to A? What would be the total time?

5. A motorboat went around a 5-mile course once in 10 minutes. How many miles an hour was its speed?

6. In a special race the Slo-Mo-Shun made a mile in 21.98 seconds. How much less than a minute was this? At this rate how long would it take the motorboat to go 3 miles? How much more than a minute would this be?

7. A motorboat went around the course in 14 minutes. How many miles a minute was its average speed? How many miles an hour?



When the Divisor Is a Decimal

Let us use the ruler above to divide by tenths.

1. How many pieces .2 inch long are there in .4 inch? How much is $.2\overline{).4}$? This example means: How many .2's are there in .4? How much is $\frac{4}{10} \div \frac{2}{10}$?

Use the picture to find the answers to the following examples. Check by division of common fractions.

	a	b	c	d	e
2.	$.2\overline{).6}$	$.2\overline{).8}$	$.4\overline{).8}$	$.2\overline{)1.2}$	$.4\overline{)1.2}$
3.	$.6\overline{)1.2}$	$.2\overline{)1}$	$.2\overline{)2}$	$.2\overline{)3}$	$.4\overline{)2}$
4.	$.2\overline{)2.4}$	$1.2\overline{)2.4}$	$1.4\overline{)2.8}$	$1.1\overline{)2.2}$	$1.5\overline{)3.0}$

Changing the Divisor When It Is a Decimal

A. $\begin{array}{r}2\\2\overline{)4}\end{array}$ B. $\begin{array}{r}2\\20\overline{)40}\end{array}$

1. In A and B the quotients are the same. To get example B both numbers in $2\overline{)4}$ were multiplied by 10. How much is $2\overline{)6}$? $20\overline{)60}$?

2. How much is $.2\overline{).4}$? How much is $2\overline{)4}$?

A. $\begin{array}{r}2\\.2\overline{).4}\end{array}$ B. $\begin{array}{r}2\\2\overline{)4}\end{array}$

In A we divide by a decimal. In B we change the divisor to a whole number by multiplying both numbers of $.2\overline{).4}$ by 10. Are the quotients the same?

$10 \times .2 = 2$
$10 \times .4 = 4$

When both the divisor and the number being divided are multiplied by 10, the quotient is not changed.

How to Divide a Whole Number by Tenths

1. We can write the example $2\overline{)4}$ as $\frac{4}{2}$. If we multiply both terms of $\frac{4}{2}$ by 10, we get $\frac{10 \times 4}{10 \times 2} = \frac{40}{20}$, or $20\overline{)40}$.

A. $\begin{array}{r} 2 \\ 2\overline{)4} \end{array}$ B. $\begin{array}{r} 2 \\ 20\overline{)40} \end{array}$

How do the quotients of A and B compare?

2. In the same way we can write the example $.2\overline{)4}$ as $\frac{4}{.2}$. If we multiply both terms of $\frac{4}{.2}$ by 10, we get $\frac{10 \times 4}{10 \times .2} = \frac{40}{2.0}$, or $2\overline{)40}$. How much is $.2\overline{)4}$? How much is $2\overline{)40}$? $4 \div \frac{2}{10} = ?$

To divide any number by tenths, use the method shown above to change the divisor to a whole number.

3. How much is $.2\overline{)6}$?

A. $.2\overline{)6}$ B. $\begin{array}{r} 30 \\ 2.\overline{)60} \end{array}$

Multiply the .2 and the 6 by 10. Then divide by the whole number 2. Check: $.2 \times 30 = 6.0$. How much is $6 \div \frac{2}{10}$?

4. How much is $6 \div 1.2$?

A. $1.2\overline{)6}$ B. $\begin{array}{r} 5 \\ 12.\overline{)60} \\ 60 \end{array}$

How do we get the 12 in B? How do we get the 60?

Show that $6 \div 1\frac{2}{10} = 5$. How much is 5×1.2?

Divide, using the method shown in 3 and 4 above. Check your answers by multiplying; by dividing.

	a	b	c	d	e
5.	$.2\overline{)4}$	$.3\overline{)6}$	$.4\overline{)8}$	$.5\overline{)4}$	$.6\overline{)42}$
6.	$.7\overline{)49}$	$.4\overline{)15}$	$.8\overline{)4}$	$.9\overline{)18}$	$.5\overline{)21}$
7.	$1.1\overline{)44}$	$1.2\overline{)24}$	$1.6\overline{)8}$	$2.5\overline{)40}$	$3.3\overline{)66}$
8.	$7.5\overline{)150}$	$3.2\overline{)1504}$	$4.8\overline{)24}$	$6.2\overline{)155}$	$9.4\overline{)752}$

MORE PRACTICE 369

Dividing a Whole Number by Hundredths

1. How much is $.08\overline{)4}$?

A. $.08\overline{)4}$ B. $\begin{array}{r} 50 \\ 8\overline{)400} \end{array}$

To change .08 to a whole number, multiply both .08 and 4 by 100. See B.

We can write $.08\overline{)4}$ as $\frac{4}{.08}$.

$$\frac{4}{.08} = \frac{100 \times 4}{100 \times .08} = \frac{400}{8} = 50.$$

Show that $4 \div \frac{8}{100} = 50.$

$50 \times .08 = ?$

2. How do we divide 6 by .15?

A. $.15\overline{)6}$ B. $\begin{array}{r} 40 \\ 15\overline{)600} \\ 60\times \\ \hline 0 \end{array}$

How do we change .15 to 15? Why must we change 6 to 600? Show that $40 \times .15 = 6$. Show also that $6 \div \frac{15}{100} = 40$.

MORE PRACTICE 369

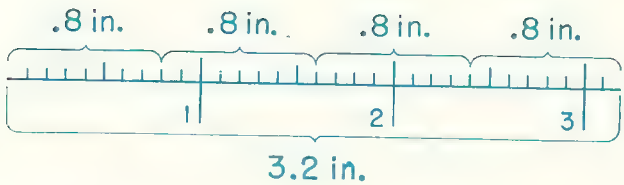
To divide by hundredths, multiply both parts of the division example by 100. Then divide.

Find the quotients using the method explained above:

	a	b	c	d	e
3.	$.06\overline{)3}$	$.04\overline{)16}$	$.05\overline{)20}$	$.07\overline{)84}$	$.09\overline{)72}$
4.	$.15\overline{)75}$	$.24\overline{)96}$	$.84\overline{)21}$	$.56\overline{)42}$	$.14\overline{)70}$
5.	$.04\overline{)3}$	$.05\overline{)3}$	$.25\overline{)1}$	$.48\overline{)24}$	$.48\overline{)12}$

Practice What You Have Learned

	a	b	c	d	e
1.	$\frac{1}{2}+\frac{1}{3}=$	$3\frac{1}{4}-1\frac{1}{2}=$	$6\times3\frac{3}{4}=$	$4\div\frac{2}{3}=$	$4\frac{1}{2}\div3=$
2.	$3\times1.48=$	$.6\times5.9=$	$7\times.038=$	$2.4\times5.9=$	$2.46\times384=$
3.	$3\overline{)6.39}$	$5\overline{)2.955}$	$7\overline{)368.2}$	$10\times2.85=$	$100\times.07=$
4.	$12\overline{)3.9}$	$8\overline{)23}$	$6\overline{)8}$	$9\overline{)4.65}$	$36\overline{)28.8}$
5.	$.6\overline{)48}$	$1.2\overline{)6}$	$.04\overline{)12}$	$.36\overline{)18}$	$2.5\overline{)375}$



Dividing a Decimal by a Decimal

1. Use the drawing above. How many lines .8 inch long are there in 3.2 inches? in 1.6 inches? in 2.4 inches?

2. Use the drawing to find the answers of the examples $.8\overline{)3.2}$, $.8\overline{)1.6}$, and $.8\overline{)2.4}$. Check your answer by multiplying the quotient by the divisor.

3. We can find $.8\overline{)3.2}$ without using the drawing as shown below. Here we are dividing a decimal by a decimal.

A. $.8\overline{)3.2}$

B.
$$\begin{array}{r} 4 \\ 8\overline{)32} \\ \underline{32} \end{array}$$

When dividing by tenths, change the divisor, .8, to a whole number. Multiply both parts of example A by 10. How do we get the 8 in B? the 32? the 4?

Check: $4 \times .8 = 3.2$. Divide $3\frac{2}{10}$ by $\frac{8}{10}$.

4. Use the method in 3 to find $.8\overline{)1.6}$ and $.8\overline{)2.4}$.

5. How much is $4.92 \div .12$? Here we divide by hundredths.

A. $.12\overline{)4.92}$

B.
$$\begin{array}{r} 41 \\ 12\overline{)492} \\ \underline{48\times} \\ 12 \\ \underline{12} \end{array}$$

At the left, how do we change the .12 in A to 12 in B?

How do we get the 492 in B?

To check the answer find $.12 \times 41$. Also find $4\frac{92}{100} \div \frac{12}{100}$.

Explain each step in the work below. Check the answers. Then copy and work the examples.

6. A. $1.2\overline{)4.68}$

B.
$$\begin{array}{r} 3.9 \\ 12\overline{)46.8} \\ \underline{36\ \times} \\ 10\ 8 \\ \underline{10\ 8} \end{array}$$

7. A. $.09\overline{)8.1}$

B.
$$\begin{array}{r} 90 \\ 9\overline{)810} \\ \underline{81\times} \\ 0 \end{array}$$

Practice in Division by Decimals

Tell where to place the decimal points in the quotients of the examples below. In which examples are zeros needed as place holders? Explain why. Check the answers.

	a	b	c	d	e
1.	$\overset{3}{.2\overline{).6}}$	$\overset{3}{.4\overline{)1.2}}$	$\overset{21}{1.7\overline{)3.57}}$	$\overset{5}{.4\overline{).2}}$	$\overset{21}{1.5\overline{)31.5}}$
2.	$\overset{42}{.08\overline{)3.36}}$	$\overset{50}{.07\overline{)3.5}}$	$\overset{25}{1.2\overline{)3}}$	$\overset{80}{.05\overline{)4}}$	$\overset{85}{.2\overline{)1.7}}$

3. Copy and work the examples. Check your answers.

Now work the examples below. Check your answers.

	a	b	c	d	e
4.	$.2\overline{).8}$	$.2\overline{)1.8}$	$.4\overline{).1}$	$.3\overline{)4.5}$	$.4\overline{).64}$
5.	$.25\overline{)3.75}$	$.12\overline{).96}$	$.15\overline{).345}$	$.14\overline{).7}$	$.2\overline{)3}$

Rounding Off in Division by Decimals

A. $\mathbf{1.2\overline{)2.84}}$

$$\overset{\mathbf{2.366}}{\mathbf{12\overline{)28.400}}}$$

B.

In the division example at the left, there is a remainder after the work has been carried to three places. You see that zeros were annexed to get three places in the quotient. To the nearest hundredth the quotient is 2.37, and to the nearest tenth, 2.4.

MORE PRACTICE 369

Round off each quotient to the nearest hundredth:

	a	b	c	d	e	f
1.	$8\overline{)9}$	$6\overline{)8}$	$.3\overline{)2.2}$	$9\overline{)4.8}$	$.7\overline{)3.46}$	$.8\overline{)3.5}$
2.	$11\overline{)17}$	$12\overline{)8}$	$.9\overline{).21}$	$.06\overline{)3.4}$	$.12\overline{)4}$	$1.6\overline{)2.6}$
3.	$24\overline{)28}$	$.48\overline{)3.72}$	$11\overline{)6}$	$.9\overline{).5}$	$1.3\overline{)8.9}$	$.37\overline{)4.10}$

★Zero As a Place Holder in Division of Decimals

1. How much is .18 ÷ 6?

A. $\begin{array}{r} 3 \\ 6\overline{).18} \end{array}$

B. $\begin{array}{r} .03 \\ 6\overline{).18} \end{array}$

Because we are dividing 18 hundredths by 6, the quotient is 3 hundredths.

To keep 3 in hundredths' place, we must write a zero before the 3. Then put the decimal point before the 0, as in B.

Prove that $\frac{18}{100} \div 6 = \frac{3}{100} = .03$. How much is $6 \times .03$?

2. Explain why zeros were written in the quotients below. Check each answer by multiplication.

a. $\begin{array}{r} .004 \\ 3\overline{).012} \end{array}$ b. $\begin{array}{r} .08 \\ 1.1\overline{).088} \end{array}$ c. $\begin{array}{r} .03 \\ .3\overline{).009} \end{array}$ d. $\begin{array}{r} .005 \\ 25\overline{).125} \end{array}$

3. Copy the examples below and put the decimal points in the quotients. Check your answers by multiplication.

a. $\begin{array}{r} 7 \\ 32\overline{)2.24} \end{array}$ b. $\begin{array}{r} 9 \\ 1.2\overline{).108} \end{array}$ c. $\begin{array}{r} 6 \\ .6\overline{).036} \end{array}$ d. $\begin{array}{r} 3 \\ .25\overline{).075} \end{array}$

Divide and check your answers.

	a	b	c	d
4.	$4\overline{).36}$	$5\overline{).035}$	$16\overline{).128}$	$1.2\overline{).096}$
5.	$1.5\overline{).075}$	$2.5\overline{).125}$	$.08\overline{).048}$	$.36\overline{).072}$
6.	$.4\overline{).032}$	$.7\overline{).392}$	$6.5\overline{).335}$	$19\overline{)1.007}$

Practice What You Have Learned

	a	b	c	d
1.	$3\frac{1}{2} + 9\frac{7}{8} =$	$.05 + .04 =$	$3\frac{3}{4} \times 2\frac{2}{5} =$	$6\frac{1}{4} - 3\frac{2}{3} =$
2.	$9.17 - 6.29 =$	$.7 \times .8 =$	$2\frac{3}{4} \times 8 =$	$4\frac{1}{2} \div 6 =$
3.	$.12\overline{)7.2}$	$2.5\overline{).125}$	$2.4 \times 6.9 =$	$7\frac{1}{2} \div \frac{3}{4} =$
4.	$.64\overline{)371.2}$	$5.7\overline{)364.8}$	$4.3\overline{)3.397}$	$.25\overline{)8}$

MORE PRACTICE 369

★Another Way to Divide by a Decimal

1. Many people use the method explained below when dividing by a decimal.

A. $1.2\overline{)33.48}$

B. $1.2_{\wedge}\overline{)}$

C. $1.2_{\wedge}\overline{)33.4_{\wedge}8}$

D. $1.2_{\wedge}\overline{)33.4_{\wedge}8}$

To change 1.2 to a whole number, we multiply by 10. This moves the decimal point one place to the right. We can show this by placing a $_{\wedge}$ after the 2 as in B to show where the decimal point then is. We must also multiply 33.48 by 10. This moves the decimal point in 33.48 one place to the right, as shown in C. The decimal point in the quotient will be above the $_{\wedge}$ in 33.48, as shown in D. Prove this by dividing $12\overline{)334.8}$.

2. Show that the $_{\wedge}$ is correctly placed in each example below. Then divide and find the quotients.

a. $1.2_{\wedge}\overline{)37.6_{\wedge}8}$ b. $.04_{\wedge}\overline{)16.33_{\wedge}2}$

c. $.6_{\wedge}\overline{)4.3_{\wedge}8}$ d. $.92_{\wedge}\overline{)1.93_{\wedge}2}$

3. Copy the examples below. Show by using $_{\wedge}$ that the decimal points are placed correctly in the quotients.

a. $\begin{array}{r} 3.1 \\ 2.2\overline{)6.8\,2} \end{array}$ b. $\begin{array}{r} 31. \\ .12\overline{)3.72} \end{array}$ c. $\begin{array}{r} 5\,4.1 \\ .4\overline{)21.6\,4} \end{array}$ d. $\begin{array}{r} 32.5 \\ .05\overline{)1.62\,5} \end{array}$

MORE PRACTICE

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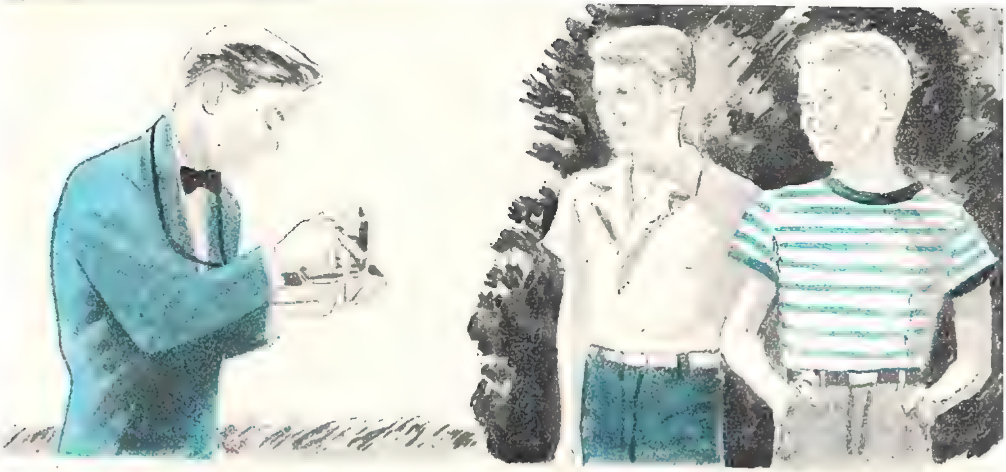
4. Copy the examples below and use the short cut to tell where to put the decimal point in the quotients.

a. $\begin{array}{r} 11 \\ .25\overline{)2.75} \end{array}$ b. $\begin{array}{r} 121 \\ 1.1\overline{)1.331} \end{array}$ c. $\begin{array}{r} 7 \\ .6\overline{).42} \end{array}$ d. $\begin{array}{r} 1\,1 \\ .12\overline{)13.2} \end{array}$

Use steps A, B, C, and D to find the quotients.

	a	b	c	d
5.	$.5\overline{)8.5}$	$.04\overline{)1.376}$	$.25\overline{)4.875}$	$3.6\overline{).792}$
6.	$5.3\overline{)22.26}$	$.43\overline{)6.622}$	$2.4\overline{)196.8}$	$3.1\overline{)19.53}$



Taking Pictures with a Camera

1. John bought a new camera for \$10. He had saved \$.25 a week to get the money to buy it. How many weeks did it take him to save the money?

2. He bought 4 rolls of film costing in all \$1.60. There was film for 8 pictures in each roll. How much was the cost of the film for one picture?

3. He took a picture one bright day exposing the film $\frac{1}{25}$ second. He should have exposed it only $\frac{1}{2}$ as long. How long should he have exposed the film?

4. How much less than $\frac{1}{25}$ second is $\frac{1}{2}$ of $\frac{1}{25}$ second?

5. John made pictures at a cost of $4\frac{1}{2}$ cents apiece. How much did it cost him to make 8 pictures?

6. A drugstore developed a roll of film with one print of each picture for 60 cents. How much more was this for one picture than it cost John to make one?

7. The picture John takes is $2\frac{1}{4} \times 3\frac{1}{4}$ inches. He enlarged a picture so that it was two times as wide and two times as long. What were the dimensions of the picture?

★ 8. Find out about the sizes of photographs that can be taken with cameras. What is a "light meter"?

Practice in Division of Decimals

Be sure to place the decimal points in the quotients correctly. Carry the work to not more than three decimal places. When there are more than two decimal places in the quotient, round it off to the nearest hundredth.

Set I. Division by Whole Numbers

	a	b	c	d
1.	2)6.8	3)9.6	2)4.6	4)4.8
2.	3)5.43	6)4.38	7)70.91	5)67.35
3.	8)9.264	6)37.992	9)17.145	5)1.985
4.	5).875	6).816	9).972	4).888
5.	24)8.4	55)3.3	5)2	16)14
6.	18)48	25)96	16)30	56)87

Set II. Division by Decimals

1.	.2)6.4	.4)8.4	1.1)9.2	2.5)7.5
2.	.4)19.76	.7)98.35	3.2)1.6	3.6).9
3.	.11)1.43	.16)33.92	.25)42.725	.17)8.704
4.	.12).9	.25)4	.05)2	.36).144
5.	.005)7.5	.012).036	.018)4.004	.036)1.23
6.	8.4)2.53	.76)9.584	3.6)12.129	.48)18

Diagnostic Test in Division of Decimals

1. $4\overline{)9.6}$ $\quad 2\overline{).8}$ $\quad 4\overline{)7.32}$ $\quad 9\overline{)7.578}$ (296, 297)

2. $2\overline{)3}$ $\quad 4\overline{)5}$ $\quad 8\overline{)17}$ $\quad 8\overline{)6}$ (300)

3. $.2\overline{)18}$ $\quad .5\overline{)40}$ $\quad 1.2\overline{)48}$ $\quad 2.5\overline{)75}$ (307)

4. $.12\overline{)36}$ $\quad .08\overline{)32}$ $\quad .16\overline{)8}$ $\quad .72\overline{)18}$ (308)

5. $.8\overline{)5.6}$ $\quad 1.2\overline{)4.56}$ $\quad .08\overline{)4.96}$ $\quad .32\overline{).672}$ (309)

6. $.4\overline{).24}$ $\quad .5\overline{).025}$ $\quad 1.4\overline{).112}$ $\quad .24\overline{).096}$ (309)

Round off the quotients to the nearest tenth:

7. $11\overline{)80}$ $\quad 1.4\overline{)7.5}$ $\quad 26\overline{)213}$ $\quad .08\overline{)1.94}$ (301)

Turn for help to the page given at the end of the row

Checking Up

1. To check up on decimals, work the first two examples in each line in the following diagnostic tests: addition, page 182; subtraction, page 185; multiplication, page 286.

2. Work also the first two examples in each line in the following diagnostic tests in common fractions:

a. addition, page 108
b. subtraction, page 117
c. multiplication, pages 204 and 223
d. division, pages 244 and 251

Using the Vocabulary of Arithmetic

Explain the meaning of the following:

average	decimal	reduce	square inch
budget	draw to scale	round numbers	surface
cancel	invest	round off	to the nearest mile

Test in Division of Decimals

Carry the work to not more than three places.

1. $8\overline{)14}$	2. $9\overline{)1.89}$	3. $4\overline{)3.616}$	4. $12\overline{)43.2}$	5. $5\overline{)1.5}$
6. $1.2\overline{)6.48}$	7. $.24\overline{)6}$	8. $.08\overline{).944}$	9. $7\overline{)36.5}$	10. $3.6\overline{)78}$

Be Careful! Some Are False!

Read each statement below. If the statement is true, write "True" on your paper. If it is false, write "False." Be ready to explain your answer.

1. The fraction $\frac{9}{21}$ is reduced to lowest terms.

2. $7\frac{1}{4} = 6\frac{5}{4}$.

3. We invert the number being divided when dividing by a fraction.

4. Multiplying both terms of a fraction by the same number changes the value of the fraction.

5. Dividing the numerator of a fraction by 4 reduces the size of the fraction.

6. To the nearest tenth of an inch 3.637 inches are equal to 3.6 inches.

7. If $\frac{3}{4}$ of a number is 18, the number is 27.

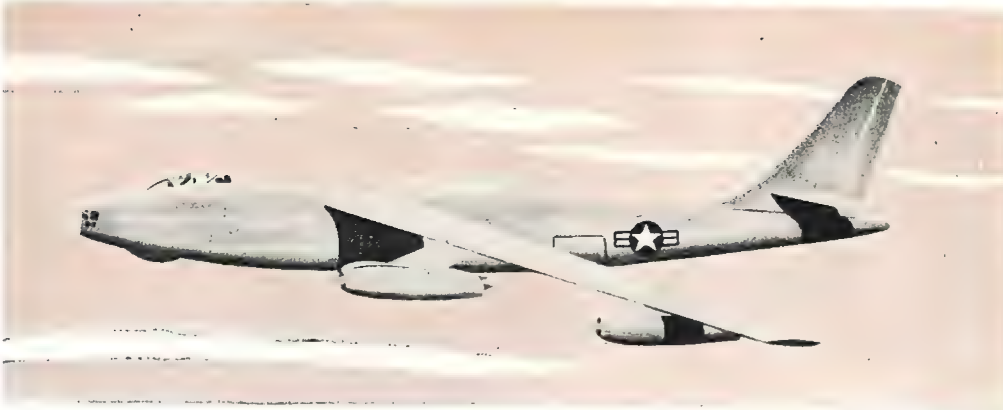
8. The quotient of $4\frac{1}{2} \div 6\frac{3}{8}$ is more than 1 whole.

9. The average of 3.6, 7.2, 8.4, and 5.7 is 6.25.

10. The perimeter of a 2.7 inch square is 10.8 inches.

11. In 27.8 the value of 2 is 100 times as great as the value of 2 in 0.278.

12. The fractions $\frac{3}{5}$, $\frac{3}{8}$, $\frac{3}{4}$, and $\frac{3}{10}$ are arranged in order of their size.



★The Results of Airplane Races

In 1952 the speed records for an airplane race were:

Plane	Miles an Hour	Plane	Miles an Hour
Swept-wing jet	594.806	Mustang	470.136
Army jet	586.173	Corsair	397.071
Banshee	548.947	Midget	177.308

1. How much greater was the speed per hour of the Army jet than of the Mustang?

2. How far could a Banshee fly in 4 hours?

3. Give the speed of each airplane to the nearest mile.

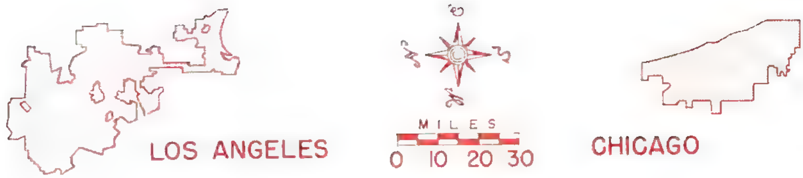
4. Find the average number of miles to the nearest mile that the Swept-wing jet flew in 1 minute.

5. Which of the airplanes had an average speed of over 9 miles a minute? of less than 3 miles a minute?

6. The greatest speed at which the Corsair flew was 406.351 miles an hour. How much above its average speed was this?

7. The Swept-wing jet used 2 gallons of fuel for each mile flown. How many gallons would the airplane use to fly for one hour at the speed given above?

★8. How many feet does a plane fly in 1 second if it flies at the speed of 10 miles a minute?



Everyday Use of Decimals

1. The area of Chicago is 211.3 square miles and of Los Angeles, 452.3 square miles. Find the difference.

2. Find the perimeter of a square flower bed that is 16.5 feet on each side. Make a rough drawing of the flower bed.

3. During a week a total of 4.48 inches of rain fell. What was the average daily rainfall?

4. A scientist has found that the body temperature of a robin is 109.6°. How much higher is this than 98.6°, the normal temperature of a human being?

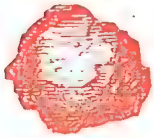
5. How much do 2 pounds 8 ounces of steak cost at $.90 a pound?

6. How many days will 10 pounds of sugar last if on the average .5 pound is used a day?

7. How many minutes are there in 1.25 hours?

8. An airplane flew 148.8 miles in 12 minutes. How many miles a minute was that on the average?

9. A gallon of water weighs 8.34 pounds. How much does a quart of water weigh?



10. In a museum there is a chunk of coal, 1 foot long, 1 foot wide, and 1 foot thick. The chunk weighs 81.25 pounds. How much more than 1 ton (2000 lb.) would 25 such chunks weigh?

11. A room is lighted by four 60-watt bulbs. How much does it cost to light the room for 4 hours at a cost of .6 cents an hour for each bulb?

Getting Ready for the Progress Test

Practice Test in Addition

	a	b	c	d	e
1.	2786 64 598	\$38.59 7.68 69.50	87.648 95.473 .069	98.4 6.4 128.7	4′ 6″ 2′ 4″ 3′ 5″
2.	$7\frac{1}{2}$ $6\frac{2}{3}$	$8\frac{3}{4}$ $7\frac{5}{6}$	$6\frac{2}{3}$ $7\frac{4}{5}$	9.67 4.33	.005 .007

Practice Test in Subtraction

1.	9002 4108	\$35.68 17.48	3.647 1.493	82.4 26.4	8′ 7″ 2′ 9″
2.	$4\frac{3}{4}$ $1\frac{3}{4}$	6 $2\frac{7}{8}$	$4\frac{5}{6}$ $1\frac{2}{3}$	$6\frac{1}{2}$ $2\frac{7}{8}$	$4\frac{3}{4}$ $1\frac{5}{6}$

Practice Test in Multiplication

1.	895 300	609 708	764 690	$27\frac{1}{2}$ 5	4 qt. 1 pt. 7
2.	$\frac{3}{4} \times 1\frac{1}{3} =$	$\frac{5}{8} \times \frac{9}{10} =$	$6 \times 7\frac{3}{4} =$	$4\frac{2}{3} \times 4\frac{2}{7} =$	$\frac{2}{3}$ of $4\frac{1}{2} =$
3.	3.95 6	3.468 5	7.2 3.4	.08 .7	4.23 .8

Practice Test in Division

1.	$67\overline{)469{,}335}$	$28\overline{)18{,}896}$	$6\overline{)33}$	$4\overline{)3}$	$3\overline{)7\text{ lb. }8\text{ oz.}}$
2.	$7 \div \frac{3}{4} =$	$\frac{5}{6} \div \frac{2}{3} =$	$5\frac{1}{2} \div 2\frac{3}{4} =$	$4 \div 6\frac{2}{3} =$	$3\frac{3}{4} \div 6 =$
3.	$8\overline{)7.4}$	$1.2\overline{)144}$	$.25\overline{)4.75}$	$1.8\overline{)33.3}$	$.04\overline{)9.6}$

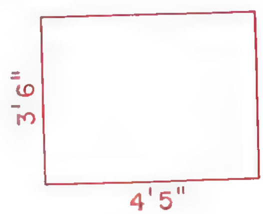
Checking on Important Points

1. Tell a quick way to multiply a whole number by 10; by 100; by 1000.

2. Tell a quick way to multiply a decimal by 10; by 100; by 1000.

3. Use two ways to change $\frac{3}{4}$ to a decimal fraction.

4. Does multiplying the denominator of a fraction by a whole number increase or decrease its value?



5. What is the perimeter of the rectangle at the right? What is its area?

6. Is $3\frac{1}{2} \div 4$ the same as $\frac{1}{4}$ of $3\frac{1}{2}$?

7. Use estimation to check your answers to the examples below.

a. $\begin{array}{r} 2.4 \\ \times 3.7 \\ \hline \end{array}$ b. $\begin{array}{r} 4.75 \\ \times 6.5 \\ \hline \end{array}$ c. $4\overline{)7.28}$ d. $1.2\overline{)3.96}$

8. Is the area of this page nearest a square inch, a square foot, or a square yard? Explain.

9. Round off to the nearest ten thousand: 68,759; 71,500.

10. Can a reduction ever be more than the regular price?

11. If $\frac{4}{5}$ of a number is 20, what is the whole number?

12. Find what part 40 is of 64.

13. Why are maps drawn to scale?

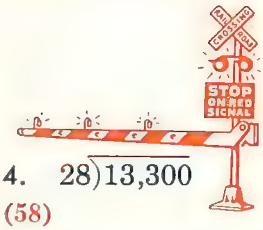
14. At 3 for 10 cents how much do a dozen apples cost?

15. How many inches are there in 1.75 feet?

16. What is wrong? $6 \div \frac{3}{4} = \frac{1}{6} \times \frac{3}{4} = \frac{3}{24} = \frac{1}{8}$.

17. Why must the answer to $\frac{3}{4} \div \frac{1}{2}$ be greater than 1?

18. Why must $\frac{3}{4} \times \frac{7}{8}$ be less than 1?



Progress Test IX

1. (15) $12{,}001 - 9{,}276$

2. (139) 8040×607

3. (137) $\$9.67 \times 800$

4. (58) $28\overline{)13{,}300}$

5. (100) $7\frac{3}{4} + 6\frac{7}{8}$

6. (111) $9\frac{1}{3} - 4\frac{5}{6}$

7. (200) $7\frac{3}{4} \times 6$

8. (151) 7 gal. 3 qt. + 6 gal. 4 qt.

9. $\frac{3}{4} \times \frac{3}{4} =$ (208)

10. $3\frac{3}{8} \times 5 =$ (202)

11. $6\frac{1}{4} \times 3\frac{3}{5} =$ (215)

12. $7\frac{1}{2} \div 3 =$ (248)

13. $\frac{7}{8} \div \frac{5}{6} =$ (251)

14. $5\frac{1}{2} \div 1\frac{1}{4} =$ (239)

15. $1.1 \times .6 =$ (281)

16. $7.2 \times 8 =$ (275)

17. (281) $6.5 \times .48$

18. $8\overline{)49.2}$ (296)

19. $.32\overline{)88}$ (308)

20. $4.8\overline{)17.6}$ (309)

For help, turn to the page given under the number of the example.

★An Arithmetic Crossword Puzzle

On your paper make a 4-inch square like the one at the right. In each small square write the answer of the example below that has the same number as the square. If your work has been correct, you will have a magic square.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1. $\frac{3}{4} \div \frac{3}{8} =$

2. $\frac{1}{2} \times \frac{3}{4} =$

3. $16 \div 64 =$

4. $65 \div 40 =$

5. $7\frac{1}{8} - 6\frac{1}{2} =$

6. $\frac{3}{4} + \frac{1}{2} =$

7. $11 \div 8 =$

8. $8.756 - 7.756 =$

9. $3 \times \frac{3}{8} =$

10. $18 = ?$ of 24

11. $1\frac{3}{4} \times \frac{1}{2} =$

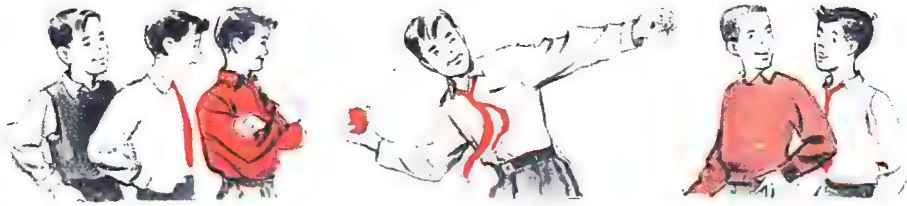
12. $.7 + .8 =$

13. $1 \div 2 =$

14. $7.500 \div 4 =$

15. $\frac{7}{8} = \frac{1}{2}$ of ?

16. How much is $7\frac{1}{2} \div 60$?



Test in Problem Solving IX

1. At 60 cents a yard how much does $\frac{3}{4}$ yard of lace cost?

2. A 12-ounce glass of honey costs 16 cents. How much is that an ounce?

3. Count 3 bananas as a pound. How much does a dozen bananas cost at 15 cents a pound?

4. A can of grapefruit weighs 1 pound 4 ounces. How much do 6 cans weigh?

5. At the rate of 48 miles an hour, how far does a train travel in $2\frac{3}{4}$ hours?

6. Find the area of a farm 1.7 mile long and 1.25 mile wide.

7. At .2 cent an hour find the cost of using a radio from 7:30 to 10:00 in the evening.

8. Janet had $8\frac{1}{2}$ yards of ribbon. She cut off 3 pieces $1\frac{3}{4}$ yards long. How long was the remaining piece?

9. Find the average speed of an airplane that flew 675 miles in 2.5 hours.

10. Milk weighs about 8.53 pounds a gallon, water about 8.34 pounds a gallon. How much more does a quart of milk weigh than a quart of water?

Did you beat your score on the last test?

6	1	0	7	7	9	6	6	8	4
1	6	7	0	9	7	6	7	4	8
7	7	7	7	16	16	12	13	12	12

Self Helps on the Addition Facts

Tell which of the above facts prove that the following statements are true.

1. When we add 1 to a number or a number to 1, the sum is 1 more than the number.

2. When we add 0 to a number or a number to 0, the sum is the same as the number.

3. To add a number to 9, or 9 to a number, add 10 to the number. Then take 1 from the sum.

4. The sum of 6 + 7 is 1 more than the sum of 6 + 6. We call 6 + 7 a **near double.**

5. The sums of 4 + 8 and 8 + 4 are the same.

Special Practice on Addition Facts

First study the examples. Then write the sums on a slip placed over the answers. Do special work on any difficult facts.

1.	9	8	9	2	4	6	9	8	3	9	6
	6	4	5	8	9	4	7	6	9	8	7
	15	12	14	10	13	10	16	14	12	17	13
2.	6	9	7	3	9	4	8	5	4	8	9
	5	4	6	7	9	5	5	7	8	7	2
	11	13	13	10	18	9	13	12	12	15	11
3.	5	9	6	8	7	4	3	5	8	4	6
	8	3	9	2	7	6	8	6	8	7	6
	13	12	15	10	14	10	11	11	16	11	12
4.	8	6	2	7	5	5	7	8	7	7	7
	9	8	9	3	9	5	8	3	5	9	4
	17	14	11	10	14	10	15	11	12	16	11

Self Helps in Addition

Go over the examples; then write the sums on paper placed over the answers. Check your work.

I. Adding by Endings

	a	b	c	d
1.	19 + 1 = 20	24 + 4 = 28	38 + 3 = 41	27 + 9 = 36
2.	47 + 8 = 55	29 + 3 = 32	25 + 5 = 30	18 + 6 = 24
3.	27 + 5 = 32	17 + 4 = 21	19 + 4 = 23	36 + 6 = 42
4.	16 + 9 = 25	28 + 9 = 37	38 + 5 = 43	29 + 2 = 31
5.	39 + 8 = 47	18 + 2 = 20	26 + 4 = 30	17 + 6 = 23
6.	36 + 5 = 41	35 + 4 = 39	49 + 7 = 56	44 + 3 = 47
7.	28 + 4 = 32	29 + 5 = 34	16 + 2 = 18	18 + 7 = 25

II. Adding Single Columns

	a	b	c	d	e	f	g	h
1.	5	7	8	9	7	6	9	6
	6	3	6	8	5	8	7	2
	1	1	5	4	8	6	3	8
	12	11	19	21	20	20	19	16
2.	6	7	5	8	9	9	8	6
	9	6	9	7	6	5	5	1
	5	4	7	7	4	4	3	1
	4	8	9	9	9	9	4	4
	24	25	30	31	28	27	20	12
3.	3	4	9	3	7	4	6	2
	7	8	2	9	9	9	5	3
	9	6	8	7	6	8	3	1
	4	3	8	1	5	5	2	8
	6	7	7	5	4	7	9	1
	3	2	3	8	6	2	2	5
	4	8	2	5	5	3	6	7
	36	38	39	38	42	38	33	27

III. Adding Two Numbers (Rows I–IV, p. 12)

	a	b	c	d	e
1.	360	245	380	430	639
(I)	233	230	910	547	550
	593	475	1290	977	1189
2.	548	682	627	408	594
(II)	147	523	259	273	464
	695	1205	886	681	1058
3.	369	589	365	387	549
(III)	187	698	979	653	751
	556	1287	1344	1040	1300
4.	690	896	780	763	704
(IV)	810	409	420	207	906
	1500	1305	1200	970	1610

IV. Adding Three and Four Numbers (Row V, p. 12)

1.	681	991	971	275	875
	682	266	304	747	376
	886	746	858	398	921
	2249	2003	2133	1420	2172
2.	878	849	638	378	778
	865	694	787	786	574
	974	897	665	299	865
	657	365	597	485	905
	3374	2805	2687	1948	3122

V. Adding Dollars and Cents (Row VI, p. 12)

Copy and add. Be sure to place the numbers correctly.

1. \$786.54 + \$9.28 + \$.56 + \$16.58 = \$812.96
2. \$5.47 + \$.08 + \$657.43 + \$24.49 = \$687.47
3. \$83.64 + \$497.52 + \$.08 + \$3.67 = \$584.91
4. \$.19 + \$375.50 + \$400.08 + \$27.40 = \$803.17
5. \$.76 + \$.69 + \$485.54 + \$.03 = \$487.02

9	6	0	7	15	8	15
−1	−6	−0	−0	−9	−7	−6
8	0	0	7	6	1	9

Self Helps on the Subtraction Facts

Tell which of the above facts prove that the statements below are correct.

1. When we subtract 1 from a number, the remainder is the next smaller number.

2. When we subtract a number from itself, the remainder is 0.

3. When we subtract 0 from a number, the remainder is the same as the number.

4. To subtract 9 from a number, subtract 10. Then add 1 to the remainder.

5. When we subtract the next smaller number from a number, the remainder is 1.

Special Practice on Subtraction Facts

Study the facts below. Write the remainders on paper placed over the answers. Practice difficult facts.

1.	11	10	15	12	10	13	11	14	11	16	12
	9	9	9	8	5	9	3	9	8	9	9
	2	1	6	4	5	4	8	5	3	7	3
2.	11	16	14	13	10	18	10	12	14	13	11
	4	8	8	5	2	9	8	3	5	6	7
	7	8	6	8	8	9	2	9	9	7	4
3.	17	13	12	16	10	14	11	15	12	17	10
	9	8	7	7	3	7	2	7	6	8	7
	8	5	5	9	7	7	9	8	6	9	3
4.	12	15	11	13	10	15	10	13	14	12	11
	5	8	6	4	4	6	6	7	6	4	5
	7	7	5	9	6	9	4	6	8	8	6

Self Helps in Subtraction

Go over the examples a row at a time to see how the numbers are subtracted. Then subtract. Write the remainders on paper placed over the answers. Check your work.

I. Subtracting Three-Place Numbers (Rows I–III, p. 16)

	a	b	c	d	e
1.	854	246	980	364	$5.97
(I)	230	213	780	264	5.04
	624	33	200	100	$ .93
2.	963	928	961	742	$8.89
(II)	781	674	357	9	7.99
	182	254	604	733	$ .90
3.	823	924	847	521	$9.16
(III)	578	356	279	439	8.49
	245	568	568	82	$ .67
4.	726	853	621	382	$8.73
(III)	648	847	585	379	.95
	78	6	36	3	$7.78

II. Subtracting Four-Place Numbers (Mixed)

1.	6284	4953	5836	8994	$99.99
	3142	2831	2736	2123	26.45
	3142	2122	3100	6871	$73.54
2.	8273	8284	8375	9112	$83.65
	3846	3517	5527	8761	79.44
	4427	4767	2848	351	$ 4.21
3.	9335	9115	2346	9111	$87.84
	5689	8136	1347	1625	68.89
	3646	979	999	7486	$18.95
4.	8297	8433	9327	3269	$74.94
	3759	4986	3578	2379	68.85
	4538	3447	5749	890	$ 6.09

III. Zeros in Subtraction (Rows IV–VI, p. 16)

Study the row of examples below. Then practice the sets of examples on this page. Check the answers.

a. $$\begin{array}{ccc} & 9 & \\ 7 & \cancel{10} & 10 \\ \cancel{8} & \cancel{0} & \cancel{0} \\ 2 & 5 & 6 \\ \hline 5 & 4 & 4 \end{array}$$

b. $$\begin{array}{ccc} & 9 & \\ 7 & \cancel{10} & 11 \\ \cancel{8} & \cancel{0} & \cancel{1} \\ 4 & 2 & 7 \\ \hline 3 & 7 & 4 \end{array}$$

c. $$\begin{array}{cccc} & 9 & 9 & \\ 7 & \cancel{10} & \cancel{10} & 10 \\ \cancel{8} & \cancel{0} & \cancel{0} & \cancel{0} \\ 5 & 2 & 6 & 8 \\ \hline 2 & 7 & 3 & 2 \end{array}$$

d. $$\begin{array}{cccc} & 9 & & \\ 7 & \cancel{10} & 10 & 10 \\ \cancel{8} & \cancel{0} & \cancel{1} & \cancel{0} \\ 7 & 2 & 6 & 4 \\ \hline & 7 & 4 & 6 \end{array}$$

	a	b	c	d	e
1.	902	801	603	960	$7.03
(IV)	614	598	186	589	4.95
	288	203	417	371	$2.08
2.	900	700	700	800	$9.00
(V)	246	557	169	203	3.08
	654	143	531	597	$5.92
3.	7000	8000	6000	9000	$50.00
(VI)	2474	3592	2605	1306	20.63
	4526	4408	3395	7694	$29.37
4.	7010	3010	9004	15,401	$180.30
(VI)	4253	2040	4178	5,842	96.25
	2757	970	4826	9,559	$84.05

IV. Mixed Practice in Subtraction

1.	8976	605	963	9790	6152
	1453	258	158	9695	3646
	7523	347	805	95	2506
2.	8050	950	8111	4010	3858
	2768	890	3642	3037	3267
	5282	60	4469	973	591
3.	$90.00	$70.02	$98.02	$17.56	$9.04
	20.29	26.33	86.00	17.46	4.59
	$69.71	$43.69	$12.02	$ .10	$4.45

1	3	0	0	5	9	6	7	6	6
3	×1	×5	×8	×6	×5	×6	×6	×9	×5
3	3	0	0	30	45	36	42	54	30

Self Helps on Multiplication Facts

Which of the facts given above prove that the statements below are correct? Give other facts for each statement.

1. When we multiply 1 by a number or a number by 1, the product is the same as the number.
2. When we multiply 0 by a number, the product is 0.
3. When we multiply a whole number by 5, or 5 by a whole number, the product ends in 0 or 5.
4. The product of 6×7 is 6 more than 6×6.
5. To multiply a number by 9, multiply the number by 10. Subtract the number from this product.
6. The product of 6×5 is the same as the product of 5×6.
7. The product of 5×9 is the sum of five 9's.

Special Practice on Multiplication Facts

Study the facts below. Write the products on paper placed over the answers. Practice difficult facts.

1.	5	5	7	6	7	3	9	7	4	8
	9	5	9	9	5	9	8	7	9	4
	45	25	63	54	35	27	72	49	36	32
2.	5	8	6	9	6	8	4	5	9	6
	6	8	4	9	8	7	8	8	6	6
	30	64	24	81	48	56	32	40	54	36
3.	4	7	4	8	5	6	9	8	7	4
	7	6	5	5	7	5	4	3	8	6
	28	42	20	40	35	30	36	24	56	24
4.	9	8	3	7	5	3	6	9	8	9
	5	6	8	4	4	6	7	3	9	7
	45	48	24	28	20	18	42	27	72	63

Self Helps in Multiplying by One-Place and Two-Place Numbers

First go over the examples a row at a time to see how the numbers were multiplied. Then copy a row of examples, close your book, and multiply. Check your answers.

I. Multiplication by One-Place Numbers (Row I, p. 21)

	a	b	c	d	e	f
1.	23 2 46	32 3 96	21 4 84	14 2 28	31 5 155	61 9 549
2.	36 4 144	28 5 140	46 3 138	29 2 58	47 8 376	$.86 6 $5.16
3.	148 5 740	259 8 2072	794 9 7146	843 7 5901	596 5 2980	$9.47 6 $56.82

II. Zeros in Multiplication by One-Place Numbers (Rows II–III, p. 21)

1. (II)	70 5 350	40 5 200	300 6 1800	510 3 1530	$8.00 9 $72.00	$7.01 8 $56.08
2. (II)	302 4 1208	501 7 3507	6030 2 12,060	6010 7 42,070	$50.01 9 $450.09	$90.03 3 $270.09
3. (III)	608 9 5472	702 7 4914	306 8 2448	907 4 3628	302 9 2718	$6.08 4 $24.32
4. (III)	$54.80 8 $438.40	$50.28 6 $301.68	$45.08 4 $180.32	$70.89 3 $212.67	$78.05 2 $156.10	$87.90 9 $791.10

III. Self Helps in Multiplying by Two-Place Numbers (Rows IV–VI, p. 21)

Study the work in these four examples before you do the practice given below. The examples are like those in the rows below having the same numbers.

1.	2.	3.	4.
28	34	904	$60.40
20	82	46	87
560	68	5424	42280
	2720	36160	483200
	2788	41584	$5254.80

	a	b	c		d	e	f
1. (IV)	36 20	284 70	$4.63 90	2. (V)	64 48	49 92	$.97 36
3. (VI)	805 63	709 76	907 51		580 94	609 73	970 43
4. (VI)	$60.40 58	$43.12 15	$12.98 .48		$58.07 29	$40.68 63	$40.80 89

The Answers

1. 720	19,880	$416.70	2.	3072	4508	$34.92
3. 50,715	53,884	46,257		54,520	44,457	41,710
4. $3,503.20	$646.80	$623.04		$1,684.03	$2,562.84	$3,631.20

IV. For Those Who Need More Practice

$.40 40	486 57	$28.06 98	795 49	9075 65	$60.09 32

The Answers

$16.00	27,702	$2,749.88	38,955	589,875	$1,922.88

1	8	0	6	9	5	8
)6	1)8	5)0	5)30	5)45	9)45	9)72

Self Helps on Division Facts

Tell which of the above facts prove that the statements below are correct. Give other facts to prove the statements.

1. When we divide a number by itself, the quotient is 1.

2. When we divide a number by 1, the quotient is the same as the number.

3. When we divide 0 by any other number, the quotient is 0.

4. Any number ending in 5 or 0 can be divided evenly by 5.

5. When we know that $5 \times 9 = 45$, we know that 9)45 is 5, and 5)45 is 9.

6. The sum of the 7 and the 2 in 72 is 9. So 72 is divisible by 9.

Special Practice on Division Facts

First study these facts. Then write the quotients on a slip placed above the answers. Do special work on any difficult facts.

	2	9	4	9	2	9	9	7	5
1.	9)18	3)27	6)24	2)18	8)16	4)36	8)72	5)35	8)40
	3	3	5	3	6	8	8	4	5
2.	6)18	7)21	6)30	9)27	8)48	7)56	5)40	7)28	9)45
	7	4	4	6	9	5	3	8	9
3.	6)42	8)32	9)36	6)36	9)81	7)35	8)24	3)24	6)54
	8	8	6	7	6	7	9	7	8
4.	9)72	4)32	7)42	3)21	9)54	4)28	7)63	2)14	8)64
	7	8	7	6	6	7	9	8	6
5.	7)49	2)16	9)63	3)18	4)24	8)56	5)45	6)48	5)30

Self Helps in Uneven Division

Go over the examples below to see how the numbers were divided. Copy the examples a row at a time, close your book, and divide. Open your book to see if your answers were correct. Rework all incorrect examples.

	a	b	c	d	e	f	g
	6 r1	3 r7	4 r4	7 r2	9 r4	9 r2	6 r5
1.	2)13	8)31	7)32	4)30	5)49	3)29	6)41
	9 r6	6 r2	4 r6	8 r2	4 r5	8 r8	8 r1
2.	9)87	3)20	9)42	6)50	8)37	9)80	2)17
	5 r6	8 r4	6 r2	9 r1	6 r8	9 r3	9 r4
3.	7)41	5)44	4)26	2)19	9)62	9)84	6)58
	8 r6	5 r5	7 r1	8 r3	3 r7	8 r1	8 r6
4.	8)70	9)50	2)15	4)35	9)34	3)25	7)62
	7 r2	9 r3	7 r7	6 r5	7 r5	2 r6	7 r5
5.	5)37	4)39	9)70	8)53	7)54	9)24	8)61

Self Helps in Division

I. Self Helps in Even Division (Row I–II, p. 27)

Study the examples below to see how the numbers were divided. Cover the answers with paper and divide. Check your answers.

	a	b	c	d	e	f
	421	321	121	310	201	201
1. (I)	2)842	3)963	4)484	2)620	3)603	4)804
	51	84	93	82	81	81
2. (II)	5)255	2)168	3)279	4)328	9)729	8)648
	905	709	608	908	709	709
3. (II)	4)3620	5)3545	7)4256	6)5448	8)5672	9)6381

II. Self Helps in Uneven Division (Rows **III–VIII**, p. 27)

The four worked-out examples match the four rows of examples below. First study the worked-out examples; then copy and work them. Check your answers.

1. $$\begin{array}{r} 28\ \text{r}1 \\ 3\overline{)85} \\ 6^{\times} \\ \hline 25 \\ 24 \\ \hline 1 \end{array}$$

2. $$\begin{array}{r} 49\ \text{r}1 \\ 4\overline{)197} \\ 16^{\times} \\ \hline 37 \\ 36 \\ \hline 1 \end{array}$$

3. $$\begin{array}{r} 903\ \text{r}4 \\ 5\overline{)4519} \\ 45^{\times\times} \\ \hline 19 \\ 15 \\ \hline 4 \end{array}$$

4. $$\begin{array}{r} 70\ \text{r}6 \\ 7\overline{)496} \\ 49^{\times} \\ \hline 6 \end{array}$$

Copy the examples a row at a time. Divide and check your answers. Rework all incorrect examples.

	a	b	c	d	e	f
1. (III–IV)	$\begin{array}{r}36\\2\overline{)72}\end{array}$	$\begin{array}{r}24\ \text{r}1\\4\overline{)97}\end{array}$	$\begin{array}{r}22\ \text{r}2\\3\overline{)68}\end{array}$	$\begin{array}{r}28\ \text{r}1\\2\overline{)57}\end{array}$	$\begin{array}{r}15\ \text{r}4\\5\overline{)79}\end{array}$	$\begin{array}{r}15\\6\overline{)90}\end{array}$
2. (V–VI)	$\begin{array}{r}37\\5\overline{)185}\end{array}$	$\begin{array}{r}340\\6\overline{)2040}\end{array}$	$\begin{array}{r}490\\9\overline{)4410}\end{array}$	$\begin{array}{r}78\ \text{r}3\\7\overline{)549}\end{array}$	$\begin{array}{r}95\ \text{r}5\\8\overline{)765}\end{array}$	$\begin{array}{r}75\ \text{r}1\\4\overline{)301}\end{array}$
3. (VII)	$\begin{array}{r}807\ \text{r}3\\6\overline{)4845}\end{array}$	$\begin{array}{r}607\ \text{r}3\\4\overline{)2431}\end{array}$	$\begin{array}{r}804\ \text{r}5\\8\overline{)6437}\end{array}$	$\begin{array}{r}807\ \text{r}7\\9\overline{)7270}\end{array}$	$\begin{array}{r}806\ \text{r}2\\5\overline{)4032}\end{array}$	$\begin{array}{r}809\ \text{r}5\\7\overline{)5668}\end{array}$
4. (VIII)	$\begin{array}{r}50\ \text{r}3\\9\overline{)453}\end{array}$	$\begin{array}{r}40\ \text{r}7\\8\overline{)327}\end{array}$	$\begin{array}{r}70\ \text{r}6\\7\overline{)496}\end{array}$	$\begin{array}{r}920\ \text{r}4\\6\overline{)5524}\end{array}$	$\begin{array}{r}230\ \text{r}4\\9\overline{)2074}\end{array}$	$\begin{array}{r}690\ \text{r}2\\5\overline{)3452}\end{array}$

III. Mixed Practice in Division by One-Figure Numbers

1.	$\begin{array}{r}68\\4\overline{)272}\end{array}$	$\begin{array}{r}74\\6\overline{)444}\end{array}$	$\begin{array}{r}89\ \text{r}1\\2\overline{)179}\end{array}$	$\begin{array}{r}302\\3\overline{)906}\end{array}$	$\begin{array}{r}145\\5\overline{)725}\end{array}$	$\begin{array}{r}168\\3\overline{)504}\end{array}$
2.	$\begin{array}{r}596\ \text{r}4\\7\overline{)4176}\end{array}$	$\begin{array}{r}907\\9\overline{)8163}\end{array}$	$\begin{array}{r}970\\4\overline{)3880}\end{array}$	$\begin{array}{r}608\ \text{r}1\\6\overline{)3649}\end{array}$	$\begin{array}{r}786\\8\overline{)6288}\end{array}$	$\begin{array}{r}964\ \text{r}2\\5\overline{)4822}\end{array}$

IV. Self Helps in Naming Quotients (Rows 1–8, Part I, page 32)

Each row of examples below has the same kinds of examples as the row with the same number in Part I on page 32. First study the example. Tell how to find the quotient figure. Then copy the examples, divide, and check your answers.

	a	b	c	d	e
1.	$\begin{array}{r}5\\10\overline{)50}\end{array}$	$\begin{array}{r}7\\10\overline{)70}\end{array}$	$\begin{array}{r}4\text{ r}7\\10\overline{)47}\end{array}$	$\begin{array}{r}6\text{ r}9\\10\overline{)69}\end{array}$	$\begin{array}{r}4\text{ r}2\\10\overline{)42}\end{array}$
2.	$\begin{array}{r}2\\20\overline{)40}\end{array}$	$\begin{array}{r}3\\30\overline{)90}\end{array}$	$\begin{array}{r}3\text{ r}7\\20\overline{)67}\end{array}$	$\begin{array}{r}2\text{ r}9\\30\overline{)69}\end{array}$	$\begin{array}{r}1\text{ r}3\\40\overline{)43}\end{array}$
3.	$\begin{array}{r}8\\40\overline{)320}\end{array}$	$\begin{array}{r}5\\50\overline{)250}\end{array}$	$\begin{array}{r}4\text{ r}18\\90\overline{)378}\end{array}$	$\begin{array}{r}8\text{ r}13\\30\overline{)253}\end{array}$	$\begin{array}{r}6\text{ r}23\\80\overline{)503}\end{array}$
4.	$\begin{array}{r}3\\23\overline{)69}\end{array}$	$\begin{array}{r}3\\31\overline{)93}\end{array}$	$\begin{array}{r}2\text{ r}5\\22\overline{)49}\end{array}$	$\begin{array}{r}2\text{ r}2\\33\overline{)68}\end{array}$	$\begin{array}{r}1\text{ r}1\\58\overline{)59}\end{array}$
5.	$\begin{array}{r}4\\42\overline{)168}\end{array}$	$\begin{array}{r}2\\53\overline{)106}\end{array}$	$\begin{array}{r}4\text{ r}3\\41\overline{)167}\end{array}$	$\begin{array}{r}4\text{ r}1\\52\overline{)209}\end{array}$	$\begin{array}{r}3\text{ r}3\\62\overline{)189}\end{array}$
6.	$\begin{array}{r}2\\35\overline{)70}\end{array}$	$\begin{array}{r}2\\46\overline{)92}\end{array}$	$\begin{array}{r}2\text{ r}5\\34\overline{)73}\end{array}$	$\begin{array}{r}3\text{ r}1\\26\overline{)79}\end{array}$	$\begin{array}{r}2\text{ r}4\\47\overline{)98}\end{array}$
7.	$\begin{array}{r}5\\96\overline{)480}\end{array}$	$\begin{array}{r}7\\84\overline{)588}\end{array}$	$\begin{array}{r}8\\67\overline{)536}\end{array}$	$\begin{array}{r}8\\87\overline{)696}\end{array}$	$\begin{array}{r}9\\97\overline{)873}\end{array}$
8.	$\begin{array}{r}9\text{ r}15\\86\overline{)789}\end{array}$	$\begin{array}{r}8\text{ r}11\\98\overline{)795}\end{array}$	$\begin{array}{r}7\text{ r}3\\68\overline{)479}\end{array}$	$\begin{array}{r}6\text{ r}9\\45\overline{)279}\end{array}$	$\begin{array}{r}6\text{ r}17\\66\overline{)413}\end{array}$

V. Mixed Practice in Naming Quotients

1.	$\begin{array}{r}7\text{ r}17\\20\overline{)157}\end{array}$	$\begin{array}{r}2\text{ r}4\\23\overline{)50}\end{array}$	$\begin{array}{r}3\text{ r}9\\46\overline{)147}\end{array}$	$\begin{array}{r}2\text{ r}16\\40\overline{)96}\end{array}$	$\begin{array}{r}5\\64\overline{)320}\end{array}$
2.	$\begin{array}{r}8\\76\overline{)608}\end{array}$	$\begin{array}{r}7\text{ r}22\\94\overline{)680}\end{array}$	$\begin{array}{r}4\text{ r}1\\37\overline{)149}\end{array}$	$\begin{array}{r}6\text{ r}6\\57\overline{)348}\end{array}$	$\begin{array}{r}7\\68\overline{)476}\end{array}$

VI. Self Helps in Division

These examples below are like those in Part II, page 32. Copy and divide. Check your work.

	a	b	c	d	e
1.	30)660	20)840	10)170	40)840	30)930
2.	36)792	25)575	23)989	35)735	24)576
3.	43)516	33)429	55)605	22)308	23)506
4.	24)750	12)389	23)492	31)345	11)367
5.	82)4264	33)1386	71)3053	45)2385	92)3423
6.	76)3220	45)2390	92)3188	75)3156	64)2250
7.	60)5749	93)4876	76)3220	61)4942	42)1008
8.	34)8264	37)11,914	56)8568	25)2775	92)19,780

The Answers

1. a. 22, b. 42, c. 17, d. 21, e. 31. 2. a. 22, b. 23, c. 43, d. 21, e. 24. 3. a. 12, b. 13, c. 11, d. 14, e. 22. 4. a. 31 r6, b. 32 r5, c. 21 r9, d. 11 r4, e. 33 r4. 5. a. 52, b. 42, c. 43, d. 53, e. 37 r19. 6. a. 42 r28, b. 53 r5, c. 34 r60, d. 42 r6, e. 35 r10. 7. a. 95 r49, b. 52 r40, c. 42 r28, d. 81 r1, e. 24. 8. a. 243 r2, b. 322, c. 153, d. 111, e. 215.

VII. For Those Who Need More Practice

	a	b	c	d	e
1.	65)2239	84)3528	32)1664	56)2892	43)2759
2.	93)4929	34)1198	36)868	22)774	57)2424
3.	65)3445	82)11,732	78)1248	21)1155	46)1070
4.	43)1462	96)5207	85)6170	61)5870	95)6037

The Answers

1. a. 34 r29, b. 42, c. 52, d. 51 r36, e. 64 r7. 2. a. 53, b. 35 r8, c. 24 r4, d. 35 r4, e. 42 r30. 3. a. 53, b. 143 r6, c. 16, d. 55, e. 23 r12. 4. a. 34, b. 54 r23, c. 72 r50, d. 96 r14, e. 63 r52.

VIII. Self Helps with Zeros in Division

The examples below are like those in Part III, page 32. Study the work carefully. Copy the four examples and divide.

1.	2.	3.	4.
40 r5	205 r1	210	7 004 r33
43)1725	23)4716	32)6720	52)364,241
172×	46××	64××	364 ×××
5	116	32	241
	115	32	208
	1	00	33

Check the answers. If you have difficulty, study again the examples above having the same number as the row.

	a	b	c	d	e
1.	26)780	97)4850	43)2590	86)6892	59)2984
2.	31)25,024	42)17,052	23)4715	66)39,872	98)69,193
3.	30)15,600	46)92,000	32)6735	54)29,160	87)35,694
4.	52)364,240	32)128,224	84)588,525	74)375,180	43)259,731

The Answers

1.	30	50	60 r10	80 r12	50 r34
2.	807 r7	406	205	604 r8	706 r5
3.	520	2000	210 r15	540	410 r24
4.	7004 r32	4007	7006 r21	5070	6040 r11

IX. For Those Who Need More Practice

1.	44)2200	86)5160	34)2380	74)4440	65)5200
2.	31)25,055	94)38,164	24)7298	85)34,510	90)87,610
3.	57)17,141	20)813	40)1627	52)22,360	42)29,417
4.	46)1384	64)4537	32)6735	75)24,031	95)38,855

The Answers

1.	50	60	70	60	80
2.	808 r7	406	304 r2	406	973 r40
3.	300 r41	40 r13	40 r27	430	700 r17
4.	30 r4	70 r57	210 r15	320 r31	409

X. Mixed Practice in Division

	a	b	c	d	e
1.	55)770	77)1386	69)1035	11)792	96)1632
2.	48)1440	85)2380	76)1976	34)850	21)1176
3.	22)1992	67)2695	34)2380	89)5370	24)964
4.	96)50,208	23)4922	75)34,149	53)23,055	66)53,262

The Answers

1.	14	18	15	72	17
2.	30	28	26	25	56
3.	90 r12	40 r15	70	60 r30	40 r4
4.	523	214	455 r24	435	807

1.	23)11,500	45)27,907	76)31,084	56)39,831	79)47,490
2.	63)3591	99)5940	65)39,264	21)1199	8)79,684
3.	88)47,696	72)40,478	96)51,264	7)56,043	9)54,457
4.	64)$41.60	95)$88.35	73)$62.78	56)$34.72	84)$70.56
5.	42)$98.70	53)$164.42	34)$137.70	37)$148.15	97)$588.99

The Answers

1.	500	620 r7	409	711 r15	601 r11
2.	57	60	604 r4	57 r2	9960 r4
3.	542	562 r14	534	8006 r1	6050 r7
4.	$.65	$.93	$.86	$.62	$.84
5.	$2.35	$3.10 r12¢	$4.05	$4.00 r15¢	$6.07 r20¢

THE WORKSHOP

Division by Two-Place Numbers

		a	b	c	d	e	f
50	1.	25)47	24)84	21)62	32)61	39)67	25)63
	2.	35)97	12)31	42)82	27)80	23)64	48)87
51	1.	26)51	24)70	27)71	38)73	26)70	38)74
	2.	25)94	36)84	48)93	49)95	37)73	29)72
	3.	24)127	36)157	45)203	74)634	65)427	35)183
	4.	43)167	87)563	96)725	67)368	57)409	77)498
	5.	86)724	46)247	58)307	36)129	68)424	95)639
52	1.	36)174	97)480	57)438	25)134	55)493	66)533
	2.	48)317	58)372	78)602	54)364	45)304	27)138
	3.	67)584	44)257	68)595	87)735	98)674	86)746
	4.	37)152	93)742	16)31	44)173	23)82	55)316
	5.	83)650	26)117	97)854	69)401	86)600	78)654
	6.	91)726	59)382	66)446	83)502	28)119	96)381
53	1.	26)253	42)402	84)810	29)271	65)602	38)357
	2.	73)702	87)816	52)500	97)913	47)433	76)723
	3.	57)523	63)611	79)724	86)804	28)260	98)904

		a	b	c	d	e	f
I (58)	1.	25)180	26)206	27)195	37)250	28)169	38)306
	2.	28)199	47)375	38)240	26)206	29)178	27)189
	3.	49)293	39)274	59)476	48)383	39)314	49)342
II (60)	1.	29)172	29)200	27)160	29)184	28)183	28)189
	2.	27)183	39)272	28)197	49)367	39)270	29)180
	3.	84)728	24)183	96)936	28)236	43)280	54)402
	4.	46)361	88)802	67)601	89)802	75)583	69)483

		a	b	c	d
III (63)	1.	27)19,008	48)21,184	56)28,524	39)11,791
	2.	96)34,920	65)43,200	84)78,980	72)52,596
	3.	36)326,880	78)316,680	29)204,463	54)166,887
	4.	26)156,234	49)392,196	35)175,265	98)882,343
	5.	69)469,200	94)714,400	75)697,550	48)216,024

		a	b	c	d	e	f
IV (66)	1.	17)127	16)80	15)75	18)43	14)120	19)104
	2.	18)65	13)91	19)86	16)128	17)94	15)120
	3.	14)96	17)113	18)104	19)175	15)104	13)110
	4.	19)157	11)90	14)62	17)158	18)148	16)147

		a	b	c	d	
I	1.	11)2309	12)9116	12)4908	13)7020	66
	2.	14)3066	15)11,145	16)4384	16)15,168	
	3.	17)69,360	17)155,574	18)84,613	18)30,680	
	4.	19)57,304	19)16,954	18)161,154	19)144,571	
I	1.	49)3378	23)5750	19)7652	69)12,371	67
	2.	28)1836	89)5340	59)38,457	47)28,680	
	3.	82)80,200	17)1259	73)1972	96)77,000	
	4.	56)5030	36)14,508	94)6478	21)84,067	
	5.	98)78,562	26)23,761	16)9123	24)1824	
	6.	35)14,725	46)24,394	27)21,762	79)32,090	
II	1.	16)1384	29)2100	19)1476	37)2947	67
	2.	38)3264	18)1368	97)6792	28)2642	
	3.	17)83,137	16)1298	26)46,597	15)7496	
	4.	37)18,794	43)21,674	31)12,493	18)94,768	
	5.	76)61,489	97)77,660	87)52,207	58)17,927	
	6.	95)19,386	84)34,146	47)13,476	54)11,151	
	7.	65)32,890	19)87,552	78)70,239	28)25,060	

Addition of Like Common Fractions

I Reduce the fractions to lowest terms:

83

1. $\frac{2}{8}$, $\frac{6}{8}$, $\frac{4}{8}$
2. $\frac{2}{6}$, $\frac{3}{6}$, $\frac{4}{6}$
3. $\frac{2}{10}$, $\frac{4}{10}$, $\frac{5}{10}$
4. $\frac{3}{12}$, $\frac{6}{12}$, $\frac{10}{12}$
5. $4\frac{2}{4}$, $3\frac{6}{8}$, $9\frac{8}{12}$, $7\frac{15}{24}$
6. $5\frac{6}{10}$, $9\frac{8}{24}$, $6\frac{15}{20}$, $8\frac{16}{24}$

II

88

	a	b	c	d	e	f	g
1.	$\begin{array}{r}\frac{3}{8}\\ \frac{1}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{5}\\ \frac{2}{5}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{8}\\ \frac{5}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{6}\\ \frac{1}{6}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{10}\\ \frac{3}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{12}\\ \frac{5}{12}\\ \hline\end{array}$	$\begin{array}{r}\frac{9}{24}\\ \frac{11}{24}\\ \hline\end{array}$
2.	$\begin{array}{r}7\frac{1}{3}\\ 4\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}4\frac{2}{5}\\ 3\frac{2}{5}\\ \hline\end{array}$	$\begin{array}{r}6\frac{1}{4}\\ 7\frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}7\frac{3}{8}\\ 2\frac{1}{8}\\ \hline\end{array}$	$\begin{array}{r}7\frac{3}{10}\\ 6\frac{1}{10}\\ \hline\end{array}$	$\begin{array}{r}5\frac{3}{6}\\ 4\frac{1}{6}\\ \hline\end{array}$	$\begin{array}{r}9\frac{5}{12}\\ 2\frac{6}{12}\\ \hline\end{array}$
3.	$\begin{array}{r}6\frac{7}{12}\\ 4\frac{1}{12}\\ \hline\end{array}$	$\begin{array}{r}9\frac{3}{8}\\ 7\frac{3}{8}\\ \hline\end{array}$	$\begin{array}{r}8\frac{5}{12}\\ 9\frac{5}{12}\\ \hline\end{array}$	$\begin{array}{r}8\frac{1}{10}\\ 5\frac{7}{10}\\ \hline\end{array}$	$\begin{array}{r}9\frac{2}{24}\\ 6\frac{15}{24}\\ \hline\end{array}$	$\begin{array}{r}7\frac{9}{16}\\ 9\frac{4}{16}\\ \hline\end{array}$	$\begin{array}{r}9\frac{29}{100}\\ 8\frac{22}{100}\\ \hline\end{array}$

III Express in simplest form:

89

1. $\frac{4}{4}$, $\frac{5}{5}$, $\frac{8}{4}$, $\frac{6}{2}$, $\frac{12}{4}$, $\frac{20}{5}$
2. $\frac{6}{4}$, $\frac{7}{4}$, $\frac{3}{2}$, $\frac{6}{5}$, $\frac{9}{6}$, $\frac{12}{8}$
3. $3\frac{2}{2}$, $5\frac{4}{4}$, $7\frac{3}{3}$, $6\frac{20}{10}$, $9\frac{6}{3}$, $8\frac{48}{24}$
4. $6\frac{3}{2}$, $7\frac{5}{4}$, $9\frac{5}{3}$, $7\frac{5}{2}$, $9\frac{21}{12}$, $9\frac{13}{10}$

IV

91

	a	b	c	d	e	f	g
1.	$\begin{array}{r}\frac{1}{3}\\ \frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{8}\\ \frac{5}{8}\\ \hline\end{array}$	$\begin{array}{r}\frac{4}{5}\\ \frac{4}{5}\\ \hline\end{array}$	$\begin{array}{r}\frac{7}{12}\\ \frac{11}{12}\\ \hline\end{array}$	$\begin{array}{r}\frac{9}{10}\\ \frac{7}{10}\\ \hline\end{array}$	$\begin{array}{r}\frac{19}{24}\\ \frac{17}{24}\\ \hline\end{array}$
2.	$\begin{array}{r}6\frac{1}{4}\\ 8\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}9\frac{1}{2}\\ 7\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}8\frac{2}{3}\\ 9\frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}8\frac{3}{4}\\ 9\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}7\frac{5}{6}\\ 9\frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}8\frac{11}{12}\\ 6\frac{1}{12}\\ \hline\end{array}$	$\begin{array}{r}5\frac{7}{8}\\ 8\frac{7}{8}\\ \hline\end{array}$
3.	$\begin{array}{r}\frac{1}{4}\\ \frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{3}\\ \frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}\frac{1}{8}\\ \frac{1}{8}\\ \hline\end{array}$	$\begin{array}{r}7\frac{2}{3}\\ 5\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \frac{1}{6}\\ \hline\end{array}$	$\begin{array}{r}8\frac{1}{8}\\ 7\frac{3}{8}\\ \hline\end{array}$	$\begin{array}{r}6\frac{1}{2}\\ 5\frac{1}{2}\\ \hline\end{array}$
4.	$\begin{array}{r}4\frac{3}{4}\\ 2\frac{1}{4}\\ \hline\end{array}$	$\begin{array}{r}3\frac{1}{2}\\ 2\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}4\frac{7}{8}\\ 2\frac{5}{8}\\ \hline\end{array}$	$\begin{array}{r}6\frac{3}{4}\\ 5\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}\frac{2}{5}\\ \frac{3}{5}\\ \hline\end{array}$	$\begin{array}{r}6\frac{1}{6}\\ \frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}9\frac{1}{2}\\ \frac{1}{2}\\ \hline\end{array}$

Subtraction of Like Common Fractions

93

	a	b	c	d	e	f	g
1.	$\frac{3}{8}$ $\frac{1}{8}$	$\frac{5}{8}$ $\frac{3}{8}$	$\frac{5}{8}$ $\frac{1}{8}$	$\frac{7}{10}$ $\frac{1}{10}$	$\frac{11}{12}$ $\frac{5}{12}$	$\frac{7}{8}$ $\frac{1}{8}$	$\frac{17}{24}$ $\frac{9}{24}$
2.	$\frac{5}{8}$ $\frac{5}{8}$	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{5}{6}$ $\frac{5}{6}$	$\frac{3}{5}$ $\frac{3}{5}$	$\frac{5}{12}$ $\frac{5}{12}$	$\frac{3}{4}$ $\frac{3}{4}$	$\frac{1}{10}$ $\frac{1}{10}$
3.	$\frac{4}{5}$ $\frac{2}{5}$	$\frac{7}{12}$ $\frac{7}{12}$	$\frac{7}{10}$ $\frac{6}{10}$	$\frac{7}{8}$ $\frac{5}{8}$	$\frac{2}{3}$ $\frac{2}{3}$	$\frac{11}{12}$ $\frac{7}{12}$	$\frac{5}{6}$ $\frac{3}{6}$
4.	$5\frac{2}{3}$ $1\frac{1}{3}$	$6\frac{3}{4}$ $6\frac{1}{4}$	$9\frac{9}{10}$ $\frac{7}{10}$	$6\frac{3}{5}$ $2\frac{1}{5}$	$8\frac{5}{6}$ $8\frac{1}{6}$	$8\frac{11}{12}$ $8\frac{5}{12}$	$9\frac{7}{8}$ $\frac{3}{8}$
5.	$8\frac{1}{4}$ $\frac{1}{4}$	$6\frac{1}{2}$ $4\frac{1}{2}$	$6\frac{19}{24}$ $3\frac{19}{24}$	$9\frac{3}{4}$ $9\frac{3}{4}$	$9\frac{2}{5}$ $4\frac{2}{5}$	$8\frac{3}{10}$ $7\frac{3}{10}$	$6\frac{2}{3}$ $\frac{2}{3}$
6.	$8\frac{5}{6}$ $4\frac{1}{6}$	$9\frac{1}{10}$ 4	$8\frac{7}{12}$ $4\frac{5}{12}$	$6\frac{1}{2}$ 4	$8\frac{7}{8}$ $5\frac{1}{8}$	$5\frac{3}{5}$ $\frac{3}{5}$	$6\frac{1}{4}$ $6\frac{1}{4}$

Supply the missing numerators:

94

1. $1 = \frac{?}{4}$ 3. $2 = 1\frac{?}{4}$ 5. $5 = 4\frac{?}{6}$ 7. $9 = 8\frac{?}{10}$ 9. $7 = 6\frac{?}{2}$

2. $2 = 1\frac{?}{2}$ 4. $4 = 3\frac{?}{3}$ 6. $8 = 7\frac{?}{8}$ 8. $7 = 6\frac{?}{12}$ 10. $12 = 11\frac{?}{5}$

95

	a	b	c	d	e	f	g
1.	1 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{7}{8}$	1 $\frac{2}{3}$	2 $\frac{5}{6}$	2 $\frac{3}{10}$	2 $\frac{4}{5}$
2.	4 $2\frac{1}{3}$	6 $3\frac{1}{2}$	9 $5\frac{3}{4}$	8 $7\frac{3}{10}$	5 $4\frac{7}{8}$	7 $4\frac{5}{6}$	9 $8\frac{7}{12}$
3.	8 $3\frac{1}{2}$	1 $\frac{1}{4}$	5 $4\frac{7}{12}$	2 $1\frac{1}{4}$	9 $7\frac{9}{10}$	1 $\frac{7}{8}$	8 $3\frac{7}{12}$

Subtraction of Like Common Fractions

I Supply the missing numerators:

	a	b	c	d	e
1.	$1\frac{1}{4} = \frac{?}{4}$	$1\frac{5}{8} = \frac{?}{8}$	$1\frac{2}{3} = \frac{?}{3}$	$1\frac{7}{12} = \frac{?}{12}$	$1\frac{3}{10} = \frac{?}{10}$
2.	$5\frac{1}{3} = 4\frac{?}{3}$	$6\frac{1}{4} = 5\frac{?}{4}$	$8\frac{1}{6} = 7\frac{?}{6}$	$6\frac{5}{8} = 5\frac{?}{8}$	$9\frac{7}{10} = 8\frac{?}{10}$
3.	$1\frac{3}{8} = \frac{?}{8}$	$5\frac{3}{8} = 4\frac{?}{8}$	$7\frac{7}{12} = 6\frac{?}{12}$	$1\frac{1}{6} = \frac{?}{6}$	$6\frac{5}{12} = 5\frac{?}{12}$

II

	a	b	c	d	e	f	g
1.	$1\frac{1}{4}$ $\underline{\frac{3}{4}}$	$1\frac{1}{6}$ $\underline{\frac{5}{6}}$	$1\frac{1}{8}$ $\underline{\frac{7}{8}}$	$1\frac{5}{8}$ $\underline{\frac{7}{8}}$	$1\frac{1}{10}$ $\underline{\frac{7}{10}}$	$1\frac{1}{3}$ $\underline{\frac{2}{3}}$	$1\frac{7}{12}$ $\underline{\frac{11}{12}}$
2.	$1\frac{3}{8}$ $\underline{\frac{5}{8}}$	$1\frac{7}{10}$ $\underline{\frac{9}{10}}$	$1\frac{1}{4}$ $\underline{\frac{2}{4}}$	$1\frac{5}{12}$ $\underline{\frac{11}{12}}$	$1\frac{3}{5}$ $\underline{\frac{4}{5}}$	$1\frac{7}{20}$ $\underline{\frac{11}{20}}$	$1\frac{5}{16}$ $\underline{\frac{9}{16}}$

III

	a	b	c	d	e	f	g
1.	$6\frac{1}{8}$ $\underline{3\frac{7}{8}}$	$6\frac{1}{10}$ $\underline{4\frac{7}{10}}$	$5\frac{1}{3}$ $\underline{2\frac{2}{3}}$	$6\frac{1}{4}$ $\underline{\frac{3}{4}}$	$5\frac{5}{8}$ $\underline{2\frac{7}{8}}$	$9\frac{7}{12}$ $\underline{6\frac{11}{12}}$	$9\frac{1}{6}$ $\underline{2\frac{5}{6}}$
2.	$9\frac{1}{5}$ $\underline{6\frac{4}{5}}$	$7\frac{3}{8}$ $\underline{6\frac{5}{8}}$	$6\frac{1}{4}$ $\underline{5\frac{2}{4}}$	$8\frac{7}{20}$ $\underline{5\frac{11}{20}}$	$9\frac{7}{10}$ $\underline{8\frac{9}{10}}$	$8\frac{7}{16}$ $\underline{7\frac{9}{16}}$	$8\frac{5}{12}$ $\underline{4\frac{11}{12}}$
3.	$9\frac{1}{3}$ $\underline{8\frac{2}{3}}$	$6\frac{3}{10}$ $\underline{4\frac{7}{10}}$	$6\frac{3}{8}$ $\underline{4\frac{7}{8}}$	$9\frac{2}{5}$ $\underline{6\frac{3}{5}}$	$4\frac{1}{12}$ $\underline{2\frac{7}{12}}$	$9\frac{1}{4}$ $\underline{7\frac{3}{4}}$	$8\frac{1}{8}$ $\underline{7\frac{7}{8}}$

Mixed Practice

IV

1.	$\frac{7}{10}$ $\underline{\frac{3}{10}}$	$6\frac{2}{3}$ $\underline{4\frac{1}{3}}$	$\frac{7}{8}$ $\underline{\frac{5}{8}}$	1 $\underline{\frac{3}{8}}$	$12\frac{2}{3}$ $\underline{8}$	$\frac{1}{6}$ $\underline{\frac{1}{6}}$	2 $\underline{\frac{3}{4}}$
2.	6 $\underline{4\frac{1}{2}}$	$6\frac{1}{4}$ $\underline{4\frac{1}{4}}$	5 $\underline{4\frac{1}{3}}$	$\frac{11}{12}$ $\underline{\frac{10}{12}}$	2 $\underline{\frac{9}{10}}$	3 $\underline{2\frac{1}{2}}$	$9\frac{3}{8}$ $\underline{4\frac{1}{8}}$
3.	$1\frac{3}{8}$ $\underline{\frac{5}{8}}$	$\frac{3}{4}$ $\underline{\frac{1}{4}}$	$9\frac{3}{8}$ $\underline{5\frac{7}{8}}$	$1\frac{2}{5}$ $\underline{\frac{3}{5}}$	$12\frac{5}{6}$ $\underline{1\frac{1}{6}}$	$7\frac{1}{10}$ $\underline{5\frac{3}{10}}$	8 $\underline{7\frac{11}{12}}$

Addition of Common Fractions

[100

	a	b	c	d	e	f	g
1.	$\frac{1}{2}$ $\frac{1}{8}$	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{1}{4}$ $\frac{1}{2}$	$\frac{3}{8}$ $\frac{1}{2}$	$\frac{1}{4}$ $\frac{3}{8}$	$\frac{3}{8}$ $\frac{3}{8}$	$\frac{3}{4}$ $\frac{1}{8}$
2.	$8\frac{1}{4}$ $7\frac{1}{4}$	$7\frac{1}{4}$ $6\frac{1}{8}$	$8\frac{1}{2}$ $9\frac{1}{8}$	$5\frac{1}{4}$ $6\frac{3}{8}$	$4\frac{1}{2}$ $7\frac{1}{4}$	$5\frac{3}{8}$ $4\frac{1}{2}$	$6\frac{3}{4}$ $5\frac{1}{8}$
3.	$5\frac{1}{8}$ $6\frac{5}{8}$	$9\frac{1}{2}$ $7\frac{1}{4}$	$\frac{1}{2}$ $\frac{3}{8}$	$\frac{3}{8}$ $\frac{1}{4}$	$6\frac{1}{4}$ $8\frac{1}{2}$	$\frac{1}{8}$ $\frac{3}{4}$	$6\frac{1}{8}$ $4\frac{5}{8}$
4.	$\frac{1}{2}$ $\frac{3}{4}$	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{7}{8}$ $\frac{1}{4}$	$\frac{1}{4}$ $\frac{3}{4}$	$\frac{7}{8}$ $\frac{5}{8}$	$\frac{3}{4}$ $\frac{5}{8}$	$\frac{7}{8}$ $\frac{3}{4}$
5.	$7\frac{1}{2}$ $5\frac{3}{4}$	$6\frac{3}{4}$ $7\frac{3}{4}$	$9\frac{5}{8}$ $7\frac{3}{4}$	$8\frac{7}{8}$ $5\frac{1}{2}$	$8\frac{3}{4}$ $5\frac{7}{8}$	$6\frac{1}{2}$ $4\frac{1}{2}$	$6\frac{3}{4}$ $9\frac{1}{2}$

I 101

	a	b	c	d	e	f	g
1.	$\frac{2}{3}$ $\frac{1}{3}$	$\frac{1}{2}$ $\frac{1}{6}$	$\frac{1}{3}$ $\frac{5}{6}$	$\frac{5}{6}$ $\frac{5}{6}$	$\frac{1}{6}$ $\frac{2}{3}$	$\frac{2}{3}$ $\frac{2}{3}$	$\frac{5}{6}$ $\frac{1}{2}$
2.	$6\frac{1}{3}$ $6\frac{1}{6}$	$8\frac{1}{2}$ $7\frac{1}{6}$	$6\frac{5}{6}$ $5\frac{1}{2}$	$8\frac{1}{2}$ $4\frac{5}{6}$	$7\frac{2}{3}$ $9\frac{5}{6}$	$7\frac{1}{3}$ $8\frac{2}{3}$	$9\frac{5}{6}$ $8\frac{1}{3}$
3.	$\frac{5}{6}$ $\frac{3}{6}$	$\frac{1}{2}$ $6\frac{5}{6}$	$8\frac{1}{3}$ $5\frac{1}{6}$	$\frac{1}{6}$ $\frac{1}{2}$	$7\frac{1}{3}$ $6\frac{5}{6}$	$8\frac{3}{4}$ $5\frac{7}{8}$	$7\frac{1}{2}$ $9\frac{1}{4}$

I Find the missing numbers: 103

	a	b	c	d	e
1.	$\frac{1}{2} = \frac{?}{10}$	$\frac{3}{4} = \frac{?}{8}$	$\frac{1}{4} = \frac{?}{8}$	$\frac{2}{3} = \frac{?}{15}$	$\frac{2}{3} = \frac{?}{24}$
2.	$\frac{3}{8} = \frac{?}{16}$	$\frac{1}{4} = \frac{?}{16}$	$\frac{2}{5} = \frac{?}{10}$	$\frac{7}{10} = \frac{?}{100}$	$\frac{7}{8} = \frac{?}{24}$
3.	$\frac{3}{4} = \frac{?}{12}$	$\frac{3}{8} = \frac{?}{16}$	$\frac{9}{10} = \frac{?}{100}$	$\frac{5}{6} = \frac{?}{24}$	$\frac{5}{6} = \frac{?}{18}$

Addition of Unlike Common Fractions

I (104)

	a	b	c	d	e	f	g
1.	$\frac{1}{4}$ $\frac{1}{5}$	$\frac{1}{3}$ $\frac{1}{4}$	$\frac{2}{5}$ $\frac{1}{2}$	$\frac{1}{3}$ $\frac{1}{2}$	$\frac{1}{3}$ $\frac{3}{8}$	$\frac{2}{5}$ $\frac{1}{6}$	$\frac{1}{6}$ $\frac{3}{4}$
2.	$6\frac{1}{3}$ $7\frac{3}{8}$	$5\frac{1}{4}$ $6\frac{1}{3}$	$8\frac{1}{6}$ $5\frac{1}{8}$	$4\frac{1}{2}$ $7\frac{1}{5}$	$6\frac{1}{6}$ $7\frac{1}{4}$	$8\frac{1}{4}$ $3\frac{2}{5}$	$8\frac{1}{4}$ $6\frac{7}{10}$
3.	$9\frac{2}{5}$ $8\frac{1}{4}$	$7\frac{1}{2}$ $3\frac{3}{8}$	$\frac{2}{3}$ $\frac{1}{4}$	$6\frac{3}{4}$ $5\frac{1}{6}$	$6\frac{3}{10}$ $4\frac{1}{4}$	$8\frac{1}{2}$ $7\frac{1}{3}$	$\frac{1}{6}$ $\frac{1}{4}$

II (104)

	a	b	c	d	e	f	g
1.	$\frac{3}{8}$ $\frac{2}{3}$	$\frac{1}{2}$ $\frac{3}{5}$	$\frac{1}{3}$ $\frac{3}{4}$	$\frac{1}{2}$ $\frac{2}{3}$	$\frac{3}{4}$ $\frac{2}{5}$	$\frac{3}{4}$ $\frac{5}{6}$	$\frac{3}{4}$ $\frac{2}{3}$
2.	$7\frac{7}{8}$ $4\frac{2}{3}$	$5\frac{7}{10}$ $2\frac{3}{4}$	$4\frac{5}{6}$ $8\frac{7}{8}$	$8\frac{5}{6}$ $\frac{3}{4}$	$4\frac{5}{8}$ $7\frac{3}{5}$	$8\frac{5}{6}$ $6\frac{3}{8}$	$8\frac{2}{3}$ $6\frac{3}{4}$
3.	$\frac{3}{8}$ $9\frac{1}{3}$	$8\frac{3}{5}$ $2\frac{1}{2}$	$\frac{2}{3}$ $\frac{3}{8}$	$\frac{1}{4}$ $\frac{1}{3}$	$8\frac{1}{6}$ $9\frac{2}{5}$	$7\frac{2}{3}$ $9\frac{1}{2}$	$9\frac{1}{2}$ $8\frac{3}{4}$

III (105) Use the smallest possible common denominator:

	a	b	c	d	e	f	g
1.	$\frac{1}{6}$ $\frac{1}{4}$	$\frac{3}{8}$ $\frac{1}{6}$	$\frac{3}{10}$ $\frac{1}{6}$	$\frac{5}{6}$ $\frac{1}{8}$	$\frac{7}{10}$ $\frac{7}{8}$	$\frac{11}{12}$ $\frac{7}{8}$	$\frac{7}{8}$ $\frac{5}{6}$
2.	$\frac{2}{3}$ $\frac{7}{8}$	$\frac{3}{4}$ $\frac{5}{6}$	$\frac{3}{10}$ $\frac{5}{8}$	$\frac{1}{2}$ $\frac{2}{3}$	$\frac{7}{8}$ $\frac{1}{6}$	$\frac{3}{4}$ $\frac{7}{8}$	$\frac{7}{8}$ $\frac{1}{6}$
3.	$9\frac{1}{6}$ $7\frac{1}{4}$	$5\frac{1}{8}$ $3\frac{1}{6}$	$6\frac{1}{4}$ $7\frac{5}{6}$	$5\frac{1}{6}$ $7\frac{9}{10}$	$7\frac{3}{8}$ $5\frac{1}{12}$	$5\frac{1}{6}$ $6\frac{3}{4}$	$8\frac{3}{4}$ $2\frac{7}{10}$
4.	$9\frac{5}{6}$ $8\frac{3}{8}$	$9\frac{5}{6}$ $6\frac{1}{2}$	$4\frac{1}{2}$ $6\frac{2}{3}$	$7\frac{3}{4}$ $9\frac{5}{6}$	$6\frac{3}{4}$ $8\frac{7}{8}$	$9\frac{5}{6}$ $7\frac{7}{8}$	$7\frac{7}{8}$ $2\frac{4}{5}$

Addition of Unlike and Like Fractions

I 106

	a	b	c	d	e	f	g
1.	$6\frac{1}{4}$ $7\frac{1}{2}$	$\frac{3}{8}$ $\frac{1}{2}$	$\frac{1}{4}$ $\frac{2}{3}$	$5\frac{5}{6}$ $\frac{1}{2}$	$6\frac{2}{3}$ $7\frac{2}{3}$	$9\frac{1}{4}$ $6\frac{3}{8}$	$8\frac{5}{6}$ $3\frac{7}{8}$
2.	$8\frac{1}{2}$ $\frac{1}{2}$	$3\frac{1}{2}$ $4\frac{1}{8}$	$\frac{7}{10}$ $\frac{7}{10}$	$5\frac{1}{4}$ $7\frac{1}{4}$	$7\frac{3}{4}$ $4\frac{7}{8}$	$\frac{3}{5}$ $4\frac{1}{2}$	$6\frac{3}{4}$ $7\frac{3}{4}$
3.	$7\frac{1}{2}$ $8\frac{1}{3}$	$9\frac{3}{4}$ $8\frac{1}{4}$	$4\frac{2}{3}$ $8\frac{3}{4}$	$7\frac{1}{2}$ $8\frac{3}{4}$	$7\frac{7}{8}$ $8\frac{1}{8}$	$6\frac{3}{4}$ $9\frac{5}{6}$	$7\frac{1}{2}$ $6\frac{2}{3}$
4.	$\frac{7}{8}$ $\frac{5}{8}$	$4\frac{3}{4}$ $8\frac{5}{6}$	$9\frac{1}{4}$ $6\frac{4}{5}$	$9\frac{7}{10}$ $8\frac{6}{10}$	$4\frac{1}{3}$ $8\frac{5}{6}$	$8\frac{3}{4}$ $9\frac{1}{2}$	$8\frac{5}{6}$ $3\frac{7}{8}$

Mixed Practice

I 106

	a	b	c	d	e	f	g
1.	$9\frac{3}{8}$ $6\frac{7}{8}$	$8\frac{1}{4}$ $7\frac{1}{2}$	$\frac{3}{8}$ $\frac{7}{8}$	$8\frac{1}{6}$ $\frac{1}{3}$	$5\frac{1}{3}$ $3\frac{3}{4}$	$5\frac{2}{3}$ $\frac{2}{3}$	$7\frac{3}{8}$ $6\frac{1}{4}$
2.	$\frac{9}{10}$ $\frac{7}{10}$	$2\frac{4}{5}$ $3\frac{1}{2}$	$2\frac{2}{3}$ $\frac{5}{6}$	$9\frac{1}{2}$ $6\frac{1}{2}$	$6\frac{3}{4}$ $7\frac{1}{4}$	$8\frac{5}{6}$ $3\frac{7}{10}$	$\frac{3}{4}$ $6\frac{3}{4}$
3.	$8\frac{3}{4}$ $4\frac{5}{6}$	$7\frac{5}{6}$ $3\frac{2}{3}$	$7\frac{7}{8}$ $6\frac{1}{2}$	$6\frac{1}{2}$ $\frac{3}{4}$	$\frac{9}{10}$ $\frac{7}{8}$	$9\frac{1}{10}$ $3\frac{9}{10}$	$\frac{5}{6}$ $8\frac{7}{8}$
4.	$9\frac{1}{4}$ $8\frac{1}{4}$	$\frac{3}{4}$ $\frac{1}{4}$	$8\frac{1}{10}$ $4\frac{1}{2}$	$\frac{5}{6}$ $\frac{7}{8}$	$\frac{7}{12}$ $\frac{2}{3}$	$6\frac{3}{4}$ $8\frac{1}{3}$	$6\frac{2}{3}$ $7\frac{2}{3}$
5.	$8\frac{7}{8}$ $2\frac{11}{16}$	$5\frac{1}{6}$ $3\frac{7}{8}$	$\frac{9}{10}$ $\frac{4}{5}$	$9\frac{1}{2}$ $8\frac{1}{2}$	$\frac{3}{4}$ $8\frac{2}{3}$	$9\frac{3}{4}$ $9\frac{5}{6}$	$\frac{3}{4}$ $\frac{4}{5}$
6.	$\frac{5}{6}$ $\frac{2}{3}$	$6\frac{3}{4}$ $7\frac{3}{4}$	$8\frac{7}{8}$ 6	$\frac{5}{6}$ $\frac{7}{8}$	$\frac{3}{4}$ 7	$\frac{7}{8}$ $\frac{1}{2}$	$9\frac{1}{2}$ $6\frac{4}{5}$

Subtraction of Unlike Fractions

I 110 Check all answers by addition:

	a	b	c	d	e	f	g
1.	$\frac{3}{4}$ $\frac{1}{2}$	$\frac{3}{4}$ $\frac{5}{8}$	$\frac{1}{2}$ $\frac{3}{8}$	$\frac{7}{8}$ $\frac{1}{2}$	$\frac{5}{8}$ $\frac{1}{4}$	$\frac{5}{6}$ $\frac{1}{2}$	$\frac{5}{6}$ $\frac{2}{3}$
2.	$7\frac{1}{2}$ $2\frac{1}{4}$	$8\frac{4}{5}$ $2\frac{3}{10}$	$7\frac{5}{8}$ $4\frac{1}{4}$	$6\frac{2}{3}$ $\frac{1}{6}$	$8\frac{3}{4}$ $2\frac{1}{2}$	$8\frac{1}{2}$ $3\frac{1}{6}$	$7\frac{5}{8}$ $2\frac{1}{2}$
3.	$5\frac{3}{4}$ $5\frac{1}{2}$	$8\frac{3}{4}$ $8\frac{3}{8}$	$7\frac{5}{6}$ $2\frac{1}{2}$	$7\frac{1}{2}$ $6\frac{5}{12}$	$8\frac{9}{10}$ $2\frac{1}{2}$	$9\frac{1}{3}$ $2\frac{1}{8}$	$8\frac{4}{5}$ $2\frac{7}{10}$

II Supply the missing numbers:

	a	b	c	d
1.	$1\frac{1}{4} = 1\frac{?}{8}$	$1\frac{1}{2} = 1\frac{?}{4}$	$1\frac{1}{8} = 1\frac{?}{16} = \frac{?}{16}$	$1\frac{1}{2} = 1\frac{?}{6} = \frac{?}{6}$
2.	$7\frac{1}{3} = 7\frac{?}{6}$	$9\frac{2}{3} = 9\frac{?}{12}$	$6\frac{2}{3} = 6\frac{?}{6} = 5\frac{?}{6}$	$7\frac{2}{3} = 7\frac{?}{9} = 6\frac{?}{9}$
3.	$8\frac{3}{4} = 8\frac{?}{12}$	$6\frac{1}{2} = 6\frac{?}{6}$	$9\frac{3}{4} = 9\frac{?}{8} = 8\frac{?}{8}$	$4\frac{3}{4} = 4\frac{?}{8} = 3\frac{?}{8}$
4.	$6\frac{5}{6} = 6\frac{?}{24}$	$9\frac{4}{5} = 9\frac{?}{10}$	$7\frac{5}{6} = 7\frac{?}{12} = 6\frac{?}{12}$	$8\frac{1}{6} = 8\frac{?}{18} = 7\frac{?}{18}$

III

	a	b	c	d	e	f	g
1.	$1\frac{1}{4}$ $\frac{3}{8}$	$1\frac{1}{2}$ $\frac{3}{4}$	$1\frac{1}{8}$ $\frac{1}{2}$	$1\frac{3}{8}$ $\frac{3}{4}$	$1\frac{1}{3}$ $\frac{5}{6}$	$1\frac{1}{10}$ $\frac{4}{5}$	$1\frac{1}{2}$ $\frac{5}{6}$
2.	$5\frac{1}{4}$ $1\frac{3}{8}$	$6\frac{1}{2}$ $\frac{3}{4}$	$7\frac{1}{8}$ $2\frac{1}{2}$	$8\frac{3}{8}$ $2\frac{3}{4}$	$4\frac{1}{3}$ $\frac{5}{6}$	$7\frac{1}{10}$ $2\frac{4}{5}$	$1\frac{1}{2}$ $\frac{5}{6}$
3.	$2\frac{1}{2}$ $1\frac{3}{4}$	$9\frac{1}{4}$ $8\frac{1}{2}$	$5\frac{1}{2}$ $2\frac{7}{8}$	$6\frac{2}{3}$ $5\frac{5}{6}$	$7\frac{1}{6}$ $4\frac{1}{2}$	$9\frac{3}{4}$ $5\frac{7}{8}$	$6\frac{1}{2}$ $5\frac{5}{8}$
4.	$4\frac{1}{10}$ $3\frac{1}{5}$	$6\frac{1}{2}$ $4\frac{1}{4}$	$9\frac{5}{6}$ $7\frac{2}{3}$	$7\frac{3}{5}$ $4\frac{9}{10}$	$7\frac{1}{4}$ $2\frac{3}{4}$	$8\frac{7}{12}$ $2\frac{5}{6}$	$6\frac{5}{12}$ $2\frac{1}{2}$

Subtraction of Unlike Fractions

	a	b	c	d	e	f	g	
I 1.	$\frac{3}{4}$ $\frac{2}{3}$	$\frac{2}{3}$ $\frac{1}{5}$	$\frac{3}{4}$ $\frac{1}{5}$	$\frac{3}{4}$ $\frac{1}{6}$	$\frac{7}{8}$ $\frac{5}{6}$	$\frac{1}{2}$ $\frac{2}{5}$	$\frac{4}{5}$ $\frac{1}{2}$	112
2.	$6\frac{2}{3}$ $4\frac{1}{4}$	$8\frac{3}{4}$ $\frac{2}{3}$	$6\frac{1}{2}$ $4\frac{1}{3}$	$5\frac{2}{3}$ $5\frac{1}{2}$	$6\frac{3}{4}$ $1\frac{3}{5}$	$7\frac{5}{6}$ $6\frac{3}{4}$	$8\frac{1}{6}$ $8\frac{1}{8}$	
3.	$10\frac{3}{4}$ $9\frac{2}{3}$	$4\frac{1}{3}$ $3\frac{1}{4}$	$7\frac{3}{4}$ $6\frac{3}{5}$	$9\frac{1}{4}$ $8\frac{1}{6}$	$9\frac{2}{3}$ $1\frac{1}{2}$	$8\frac{1}{2}$ $1\frac{1}{5}$	$5\frac{7}{8}$ $4\frac{5}{6}$	

II 1.	$1\frac{1}{4}$ $\frac{2}{3}$	$1\frac{3}{4}$ $\frac{5}{6}$	$1\frac{5}{6}$ $\frac{7}{8}$	$1\frac{1}{2}$ $\frac{4}{5}$	$1\frac{1}{3}$ $\frac{3}{4}$	$1\frac{1}{3}$ $\frac{7}{8}$	$1\frac{7}{10}$ $\frac{7}{8}$	113
2.	$5\frac{1}{4}$ $2\frac{1}{3}$	$7\frac{1}{2}$ $4\frac{3}{5}$	$5\frac{1}{2}$ $4\frac{2}{3}$	$8\frac{1}{6}$ $3\frac{7}{8}$	$9\frac{2}{3}$ $1\frac{3}{4}$	$9\frac{1}{3}$ $8\frac{1}{2}$	$6\frac{3}{4}$ $\frac{5}{6}$	
3.	$1\frac{1}{2}$ $\frac{3}{4}$	$1\frac{1}{4}$ $\frac{3}{8}$	$1\frac{1}{8}$ $\frac{3}{4}$	$6\frac{7}{8}$ $2\frac{5}{6}$	9 $3\frac{5}{8}$	$8\frac{1}{2}$ $7\frac{2}{3}$	$7\frac{1}{2}$ $2\frac{7}{10}$	

Mixed Practice

II 1.	$\frac{7}{8}$ $\frac{1}{8}$	$\frac{3}{4}$ $\frac{1}{2}$	$4\frac{3}{4}$ $3\frac{1}{8}$	$5\frac{3}{10}$ $2\frac{3}{10}$	$6\frac{7}{12}$ $1\frac{5}{12}$	$\frac{3}{4}$ $\frac{5}{8}$	$1\frac{3}{8}$ $\frac{7}{8}$	116
2.	$4\frac{5}{6}$ $3\frac{2}{3}$	$6\frac{1}{4}$ $2\frac{3}{4}$	7 $1\frac{7}{12}$	$5\frac{1}{2}$ $2\frac{1}{4}$	$9\frac{3}{8}$ $2\frac{3}{4}$	$8\frac{1}{5}$ $2\frac{7}{10}$	$8\frac{1}{2}$ $7\frac{3}{4}$	
3.	$\frac{2}{3}$ $\frac{1}{4}$	$\frac{5}{6}$ $\frac{1}{4}$	$\frac{4}{5}$ $\frac{2}{3}$	$\frac{7}{8}$ $\frac{5}{6}$	$1\frac{1}{2}$ $\frac{3}{4}$	$1\frac{1}{2}$ $\frac{4}{5}$	$1\frac{1}{4}$ $\frac{5}{6}$	
4.	$6\frac{2}{3}$ $5\frac{3}{4}$	$1\frac{1}{2}$ $\frac{7}{10}$	$7\frac{7}{8}$ $2\frac{1}{2}$	9 $8\frac{3}{8}$	$3\frac{5}{6}$ $2\frac{7}{8}$	$16\frac{1}{4}$ 12	$7\frac{9}{10}$ $2\frac{3}{4}$	

Multiplication by Three-Place Numbers

		a	b	c	d	e	f
I 137	1.	256	524	607	423	798	746
		200	700	300	500	200	600
	2.	532	436	834	947	689	652
		600	800	900	400	900	400
II 138	1.	815	896	852	471	528	603
		531	697	642	795	468	987
	2.	7205	6013	2754	5724	8794	6952
		879	684	859	315	264	957
	3.	$61.03	$90.47	$81.94	$83.60	$97.04	$90.63
		426	839	798	579	846	153
III 139	1.	639	174	427	$7.42	$4.70	$8.15
		209	708	509	308	106	407
	2.	825	473	926	$7.04	$6.13	$8.35
		807	704	601	902	905	803
	3.	693	9150	8905	$90.26	$38.50	$80.25
		780	380	950	470	160	920

Mixed Practice

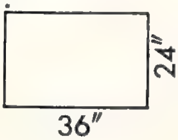
IV 139	1.	756	875	906	849	609	312
		357	900	305	724	809	906
	2.	705	213	498	507	657	960
		790	580	815	450	149	400
	3.	$75.60	690	956	321	570	$90.84
		268	607	109	700	860	936

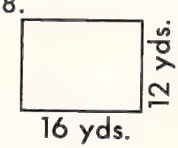
Work with Measures

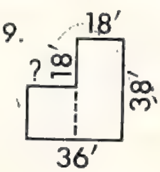
Find the areas of the following rectangles:

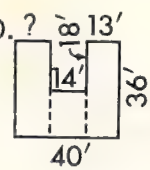
1. A handkerchief 10 inches square.
2. A garden 40 feet by 30 feet.
3. A carpet 8 yards by 5 yards.
4. A farm 440 feet by 880 feet.
5. A county 30 miles by 28 miles.
6. How much more than an acre is a playground that is 300 feet long and 210 feet wide?

Find the perimeters and the areas of the pieces of land represented by the following drawings:

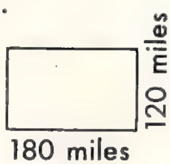
7.


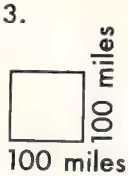
8.


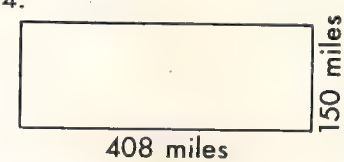
9.


10.


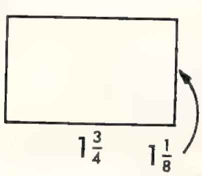
11.

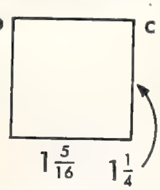

12.


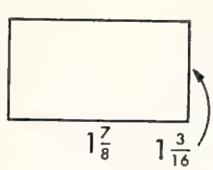
13.


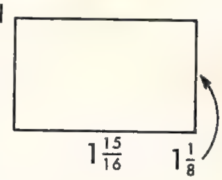
14.


15. Which of the following have the greatest perimeter?

a


b


c


d


16. How much greater is the perimeter of a than of b?
17. How much less is the perimeter of a than of c?
18. Draw a rectangle $2\frac{1}{2}$ inches by $1\frac{3}{4}$ inches. Find its perimeter.
19. Draw a rectangle $3\frac{7}{8}$ inches long and $1\frac{15}{16}$ inches wide. Find the perimeter of the rectangle.

Work with Measures

I (147)

1. 6 in. = ? ft.
2. 1 qt. = ? gal.
3. 12 in. = ? yd.
4. 12 oz. = ? lb.
5. 20 min. = ? hr.
6. 6 qt. = ? gal.
7. 30 in. = ? ft.
8. 20 oz. = ? lb.
9. 75 min. = ? hr.
10. 5 ft. = ? yd.
11. 9 pt. = ? qt.
12. 48 in. = ? yd.
13. 12 hr. = ? da.
14. 10 qt. = ? gal.
15. 56 oz. = ? lb.
16. 3 ft. 6 in. = ? in.
17. 3 gal. 2 qt. = ? qt.
18. 4 qt. $1\frac{1}{4}$ pt. = ? pt.
19. 4 lb. $8\frac{1}{2}$ oz. = ? oz.
20. 4 hr. 30 min. = ? min.
21. 3 min. $7\frac{7}{10}$ sec. = ? sec.
22. 2 lb. $7\frac{3}{4}$ oz. = ? oz.
23. 5 yd. 8 in. = ? in.
24. 3 T. 250 lb. = ? lb.
25. 4 da. $6\frac{1}{2}$ hr. = ? hr.

II (149)

1. 2 hr. 15 min. = ? hr.
2. 4 min. 45 sec. = ? min.
3. 7 da. 12 hr. = ? da.
4. 5 lb. 8 oz. = ? lb.
5. 7 lb. 12 oz. = ? lb.
6. 5 gal. 2 qt. = ? gal.
7. 3 qt. 1 pt. = ? qt.
8. 5 ft. 9 in. = ? ft.
9. 4 yd. 2 ft. = ? yd.
10. 9 yd. 6 in. = ? yd.

III (150)

1. 44 in. = ? ft. ? in.
2. 7 ft. = ? yd. ? ft.
3. 70 oz. = ? lb. ? oz.
4. 18 qt. = ? gal. ? qt.
5. 27 da. = ? wk. ? da.
6. 9 pt. = ? qt. ? pt.

Find the missing number in each example below.

7. 4 yd. 5 ft. = 5 yd. ? ft.
8. 6 ft. 18 in. = 7 ft. ? in.
9. 8 lb. 24 oz. = 9 lb. ? oz.
10. 4 qt. 5 pt. = 6 qt. ? pt.
11. 5 hr. 80 min. = 6 hr. ? min.
12. 6 gal. 7 qt. = 7 gal. ? qt.
13. 4 yr. 19 mo. = 5 yr. ? mo.
14. 5 bu. 6 pk. = 6 bu. ? pk.

IV (150)

Find the missing number in each example below.

1. 5 ft. 6 in. = 4 ft. ? in.
2. 3 qt. 1 pt. = 2 qt. ? pt.
3. 5 yd. 1 ft. = 4 yd. ? ft.
4. 6 lb. 8 oz. = 5 lb. ? oz.
5. 7 lb. $6\frac{1}{2}$ oz. = 6 lb. ? oz.
6. 8 hr. 15 min. = 7 hr. ? min.
7. 4 wk. 5 da. = 3 wk. ? da.
8. 9 min. 12 sec. = 8 min. ? sec.

Work with Measures

		a	b	c	d	
I	1.	3 gal. 2 qt. +4 gal. 1 qt.	5 yd. 1$\frac{1}{2}$ ft. +7 yd. $\frac{1}{2}$ ft.	5 lb. 8 oz. +4 lb. 7 oz.	4 hr. 30 min. +3 hr. 20 min.	151
	2.	4 bu. 2 pk. +1 bu. 1 pk.	4 gal. 1$\frac{1}{2}$ qt. +2 gal. $\frac{1}{2}$ qt.	6 qt. $\frac{3}{4}$ pt. +1 qt. $\frac{1}{4}$ pt.	12 da. 6 hr. +5 da. 7 hr.	
	3.	3 ft. 8 in. +5 ft. 7 in.	8 yd. 2 ft. +3 yd. 1 ft.	5 lb. 12 oz. +7 lb. 8 oz.	5 min. 45 sec. +6 min. 30 sec.	
	4.	4 bu. 3$\frac{1}{2}$ pk. +5 bu. 1$\frac{1}{2}$ pk.	6 gal. 2$\frac{1}{2}$ qt. +3 gal. 3$\frac{1}{2}$ qt.	3 qt. 1$\frac{1}{4}$ pt. +2 qt. 1$\frac{1}{4}$ pt.	4 da. 15 hr. +3 da. 9 hr.	
II	1.	4 gal. 3 qt. −1 gal. 2 qt.	7 ft. 10 in. −3 ft. 5 in.	5 hr. 20 min. −4 hr. 8 min.	8 lb. 9$\frac{1}{2}$ oz. −4 lb. 2$\frac{1}{2}$ oz.	152
	2.	5 min. 36 sec. −2 min. 15 sec.	5 yr. 7 mo. −5 yr. 2 mo.	8 yd. 2 ft. −4 yd. 2 ft.	8 T. 700 lb. −4 T. 500 lb.	
	3.	4 lb. 2 oz. −2 lb. 6 oz.	4 ft. 6 in. −3 ft. 8 in.	5 min. 15 sec. −3 min. 45 sec.	5 gal. 2 qt. −2 gal. 3$\frac{1}{2}$ qt.	
	4.	9 yr. −1 yr. 4 mo.	9 yd. 1$\frac{1}{2}$ ft. −5 yd. 2 ft.	15 ft. 9 in. −9 ft. 10$\frac{1}{2}$ in.	4 bu. 2 pk. −1 bu. 2$\frac{1}{2}$ pk.	
III	1.	4 ft. 18 in. +3 ft. 6 in.	9 lb. 8$\frac{1}{2}$ oz. +7 lb. 4$\frac{1}{2}$ oz.	5 yd. 18 in. +3 yd. 32 in.	4 hr. 28 min. +3 hr. 45 min.	152
	2.	9 ft. 7 in. −2 ft. 4$\frac{1}{2}$ in.	5 min. 6$\frac{4}{5}$ sec. −5 min. 4$\frac{1}{5}$ sec.	5 yd. 2$\frac{1}{2}$ ft. −1 yd. 1$\frac{1}{2}$ ft.	9 lb. 12 oz. −6 lb. 12 oz.	
	3.	4 hr. 12 min. −2 hr. 20 min.	6 yd. 1$\frac{1}{2}$ ft. −4 yd. 2$\frac{1}{2}$ ft.	7 da. 3 hr. −6 da. 12 hr.	7 yr. 4 mo. −5 yr. 8 mo.	

Addition of Decimal Fractions

Go over your work to check all answers.

		a	b	c	d	e	f	g
I 162	1.	.3	.3	.2	.6	.1	.4	.5
		.4	.6	.7	.1	.1	.5	.2
	2.	6.1	9.2	2.5	29.5	5.0	16.7	32.9
		7.2	13.7	1.3	.3	7.3	8.2	44.0
II 164	1.	.4	.7	.6	.8	.4	.9	.4
		.9	.3	.9	.6	.7	.7	.8
	2.	29.8	7.2	30.6	4.7	39.9	9.1	5.6
		32.6	19.8	47.9	29.6	19.8	8.9	16.4
III 173	1.	.57	.07	.64	.85	.09	.97	.50
		.22	.02	.56	.95	.38	.84	.26
	2.	8.56	9.84	8.65	7.15	6.58	2.09	9.86
		2.35	5.31	9.27	2.53	9.78	3.07	7.58
	3.	9.04	.85	6.20	.08	.06	.36	.08
		.76	.97	.08	.05	.02	2.04	.95
IV 180	1.	.321	.596	.392	.003	.758	.019	.989
		.143	.438	.446	.005	.684	.239	.786
	2.	6.215	8.239	6.305	6.009	8.005	9.000	7.004
		3.143	2.478	2.409	7.010	9.007	6.104	6.002

Mixed Practice

V 180	1.	.364	.3	2.54	6.7	.01	9.8	7.689
		.259	.4	13.79	9.5	.03	6.4	9.843
		.187	.7	.08	8.6	.05	5.9	6.798

Subtraction of Decimal Fractions

Check all answers by addition.

		a	b	c	d	e	f	g	
I	1.	.6	.8	.9	.6	.7	.5	.4	166
		.5	.3	.1	.2	.6	.5	.3	
	2.	7.4	18.7	34.5	9.6	24.2	8.9	92.6	
		2.3	9.4	8.4	3.6	21.2	2.7	28.4	
	3.	1.7	1.3	5.1	6.0	73.3	81.5	90.4	
		.8	.9	2.2	5.9	26.4	57.6	27.9	
II	1.	.87	.93	.84	.52	.67	.88	.70	174
		.53	.81	.65	.28	.63	.59	.64	
	2.	8.79	14.05	7.19	6.04	3.28	5.13	9.26	
		1.51	9.02	6.27	.38	2.67	3.49	8.54	
	3.	3.5	.67	3.54	.9	2.3	41.3	5.46	
		1.5	.59	1.79	.5	1.6	32.5	2.88	
II	1.	.714	.904	.811	.800	.750	.902	.830	180
		.112	.206	.294	.216	.208	.202	.296	
	2,	1.586	6.005	3.258	1.426	7.208	9.989	9.040	
		.879	2.375	2.639	.927	3.196	7.994	1.376	
V	1.	3.4	.68	.352	76.5	.27	.8	2.642	180
		2.1	.37	.184	8.7	.19	.5	1.479	
	2.	.26	26.4	.042	4.92	.508	3.170	1.6	
		.14	18.7	.016	2.87	.426	1.586	.7	
	3.	.327	9.4	54.38	.006	8.9	4.000	94.52	
		.146	9.2	26.78	.002	.4	1.706	89.46	

Multiplication of Fractions

		a	b	c	d	e
I	1.	$2 \times \frac{5}{8} =$	$3 \times \frac{5}{8} =$	$4 \times \frac{7}{8} =$	$6 \times \frac{7}{8} =$	$10 \times \frac{7}{8} =$
196	2.	$2 \times \frac{1}{6} =$	$3 \times \frac{1}{6} =$	$5 \times \frac{5}{6} =$	$6 \times \frac{5}{6} =$	$12 \times \frac{5}{6} =$
	3.	$3 \times \frac{1}{2} =$	$4 \times \frac{1}{2} =$	$6 \times \frac{3}{4} =$	$4 \times \frac{2}{3} =$	$9 \times \frac{2}{3} =$
	4.	$5 \times \frac{1}{4} =$	$4 \times \frac{1}{6} =$	$6 \times \frac{7}{8} =$	$4 \times \frac{9}{10} =$	$7 \times \frac{11}{12} =$
II	1.	$\frac{1}{4} \times 9 =$	$\frac{1}{8} \times 6 =$	$\frac{1}{5} \times 7 =$	$\frac{1}{2} \times 8 =$	$\frac{1}{3} \times 5 =$
197	2.	$\frac{7}{8} \times 2 =$	$\frac{5}{8} \times 6 =$	$\frac{3}{8} \times 4 =$	$\frac{1}{8} \times 6 =$	$\frac{3}{4} \times 7 =$
	3.	$\frac{1}{4}$ of $16 =$	$\frac{3}{4}$ of $16 =$	$\frac{3}{4}$ of $12 =$	$\frac{2}{3}$ of $12 =$	$\frac{3}{4}$ of $20 =$
	4.	$\frac{7}{8} \times 5 =$	$\frac{3}{8} \times 10 =$	$\frac{2}{3}$ of $18 =$	$\frac{3}{5}$ of $16 =$	$\frac{2}{3} \times 9 =$

		a	b	c	d	e	f	g
III	1.	$2\frac{1}{2}$	$7\frac{3}{8}$	$9\frac{1}{4}$	$4\frac{1}{4}$	$5\frac{3}{8}$	$7\frac{3}{4}$	$5\frac{7}{8}$
200		6	5	2	3	2	2	2
	2.	$8\frac{3}{4}$	$7\frac{5}{6}$	$8\frac{1}{2}$	$6\frac{3}{4}$	$9\frac{3}{4}$	$6\frac{3}{10}$	$9\frac{5}{6}$
		4	3	5	7	6	5	8
	3.	$12\frac{1}{3}$	$7\frac{2}{3}$	$8\frac{3}{8}$	$6\frac{3}{4}$	$9\frac{1}{2}$	$18\frac{5}{6}$	$9\frac{7}{8}$
		5	4	4	8	3	9	6
IV	1.	8	24	16	25	20	32	24
202		$4\frac{1}{2}$	$3\frac{1}{8}$	$2\frac{1}{4}$	$3\frac{1}{5}$	$3\frac{3}{4}$	$5\frac{1}{8}$	$4\frac{7}{8}$
	2.	11	18	18	21	47	80	216
		$2\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{5}$	$4\frac{2}{3}$	$3\frac{3}{8}$
	3.	14	8	14	44	16	9	20
		$3\frac{1}{2}$	$5\frac{3}{10}$	$3\frac{3}{4}$	$3\frac{7}{8}$	$6\frac{2}{3}$	$4\frac{1}{3}$	$3\frac{4}{5}$

Multiplication of Fractions

		a	b	c	d	e
I	1.	$3 \times \frac{5}{8} =$	$\frac{3}{4}$ of $36 =$	$5 \times \frac{3}{4} =$	$6 \times \frac{7}{8} =$	$\frac{5}{16}$ of $8 =$
	2.	$4 \times \frac{2}{3} =$	$\frac{7}{8} \times 4 =$	$8 \times \frac{3}{5} =$	$\frac{5}{6} \times 3 =$	$\frac{3}{4}$ of $18 =$
	3.	$7\frac{1}{2}$ $\underline{4}$	8 $\underline{4\frac{1}{2}}$	4 $\underline{5\frac{1}{8}}$	$8\frac{3}{4}$ $\underline{6}$	9 $\underline{2\frac{2}{3}}$
	4.	6 $\underline{4\frac{1}{6}}$	$5\frac{1}{4}$ $\underline{8}$	9 $\underline{2\frac{3}{5}}$	6 $\underline{2\frac{3}{4}}$	$6\frac{7}{8}$ $\underline{5}$
II	1.	$\frac{1}{2} \times \frac{1}{6} =$	$\frac{1}{2} \times \frac{5}{6} =$	$\frac{1}{2}$ of $\frac{3}{4} =$	$\frac{3}{8} \times \frac{1}{4} =$	$\frac{1}{4} \times \frac{2}{3} =$
	2.	$\frac{2}{3}$ of $\frac{3}{4} =$	$\frac{4}{9} \times \frac{3}{4} =$	$\frac{2}{5} \times \frac{5}{8} =$	$\frac{6}{10} \times \frac{2}{3} =$	$\frac{3}{10}$ of $\frac{7}{10} =$
	3.	$\frac{5}{6} \times \frac{4}{5} =$	$\frac{2}{3} \times \frac{9}{10} =$	$\frac{1}{2} \times \frac{4}{5} =$	$\frac{1}{4} \times \frac{1}{8} =$	$\frac{5}{10} \times \frac{4}{10} =$
	4.	$5 \times \frac{1}{8} =$	$\frac{7}{8} \times \frac{4}{9} =$	$\frac{1}{2}$ of $\frac{1}{2} =$	$\frac{1}{6} \times 4 =$	$\frac{9}{10}$ of $\frac{4}{9} =$
III	1.	$\frac{14}{21} \times \frac{3}{8} =$	$\frac{8}{9} \times \frac{1}{4} =$	$\frac{3}{4}$ of $\frac{2}{3} =$	$\frac{5}{6} \times \frac{3}{5} =$	$\frac{12}{20} \times \frac{12}{15} =$
	2.	$\frac{4}{5}$ of $\frac{5}{8} =$	$\frac{3}{10} \times \frac{2}{3} =$	$\frac{5}{9} \times \frac{3}{5} =$	$\frac{2}{3} \times \frac{5}{6} =$	$\frac{16}{24} \times \frac{3}{8} =$
	3.	$\frac{5}{6} \times 30 =$	$25 \times \frac{3}{5} =$	$\frac{3}{4}$ of $18 =$	$36 \times \frac{7}{9} =$	$\frac{7}{8}$ of $24 =$
	4.	$6 \times \frac{3}{4} =$	$\frac{1}{2}$ of $9 =$	$\frac{7}{8} \times 12 =$	$\frac{3}{4}$ of $15 =$	$\frac{2}{3}$ of $20 =$
	5.	$\frac{1}{4}$ of $32 =$	$\frac{3}{8} \times \frac{5}{6} =$	$8 \times \frac{4}{5} =$	$\frac{2}{3}$ of $18 =$	$\frac{1}{2} \times \frac{1}{4} =$
V	1.	$\frac{1}{2} \times 1\frac{1}{2} =$	$\frac{1}{4} \times 1\frac{1}{2} =$	$\frac{1}{3}$ of $1\frac{2}{3} =$	$\frac{1}{2}$ of $1\frac{3}{4} =$	$\frac{3}{4} \times 1\frac{1}{6} =$
	2.	$1\frac{1}{4} \times \frac{1}{2} =$	$1\frac{1}{5} \times \frac{1}{3} =$	$1\frac{1}{2} \times \frac{3}{4} =$	$1\frac{1}{4} \times \frac{2}{3} =$	$1\frac{7}{8} \times \frac{2}{3} =$
	3.	$2\frac{1}{2} \times \frac{1}{2} =$	$\frac{1}{4} \times 2\frac{2}{3} =$	$\frac{1}{2}$ of $2\frac{1}{2} =$	$\frac{3}{4} \times 1\frac{2}{3} =$	$\frac{5}{6}$ of $1\frac{1}{2} =$
	4.	$\frac{1}{2} \times 7 =$	$\frac{2}{3} \times \frac{2}{3} =$	$8 \times 1\frac{1}{2} =$	$9 \times \frac{3}{4} =$	$\frac{4}{5} \times \frac{5}{6} =$
	5.	$3\frac{1}{3} \times \frac{1}{8} =$	$6 \times \frac{4}{5} =$	$\frac{1}{4} \times 1\frac{1}{3} =$	$\frac{2}{3} \times 12 =$	$\frac{1}{2} \times \frac{2}{3} =$

20
208
209
211

Multiplication of Fractions

		a	b	c	d
I	1.	$\frac{1}{2} \times \frac{1}{6} =$	$\frac{3}{4} \times 5 =$	$\frac{3}{4}$ of $\frac{1}{2} =$	$4 \times \frac{5}{6} =$
211	2.	$\frac{7}{12} \times \frac{3}{4} =$	$4 \times \frac{1}{8} =$	$\frac{3}{10} \times \frac{2}{3} =$	$\frac{1}{2} \times 1\frac{1}{5} =$
	3.	$1\frac{2}{3} \times \frac{3}{5} =$	$\frac{2}{3} \times 1\frac{1}{2} =$	$\frac{7}{15} \times \frac{5}{14} =$	$1\frac{3}{4} \times \frac{2}{3} =$
	4.	6 $4\frac{5}{6}$	$8\frac{1}{2}$ 3	12 $2\frac{3}{4}$	$9\frac{3}{4}$ 6
II	1.	$2\frac{1}{2} \times 3\frac{1}{4} =$	$2\frac{2}{3} \times 2\frac{1}{4} =$	$1\frac{4}{9} \times 5\frac{5}{8} =$	$3\frac{4}{5} \times 4\frac{1}{2} =$
215	2.	$1\frac{1}{3} \times 4\frac{1}{2} =$	$3\frac{1}{3} \times 3\frac{3}{5} =$	$2\frac{1}{7} \times 1\frac{2}{5} =$	$2\frac{2}{5} \times 6\frac{1}{4} =$
	3.	$4\frac{2}{3} \times 5\frac{1}{4} =$	$2\frac{1}{4} \times 1\frac{1}{2} =$	$4\frac{2}{5} \times 5\frac{1}{2} =$	$2\frac{2}{3} \times 2\frac{1}{4} =$
	4.	$7\frac{1}{4} \times 1\frac{1}{3} =$	$\frac{1}{2} \times 4\frac{1}{4} =$	$6 \times 2\frac{1}{2} =$	$5\frac{1}{4} \times \frac{2}{3} =$
III	1.	$\frac{3}{8} \times 4\frac{1}{5} =$	$2\frac{1}{6} \times \frac{3}{4} =$	$2\frac{1}{2} \times 4\frac{2}{3} =$	$\frac{3}{4} \times 3\frac{1}{5} =$
216	2.	$1\frac{5}{7} \times 5\frac{5}{6} =$	$1\frac{1}{3} \times 7\frac{1}{2} =$	$1\frac{1}{4} \times \frac{2}{5} =$	$5\frac{1}{4} \times 3\frac{5}{6} =$
	3.	$6\frac{2}{3} \times 4\frac{3}{4} =$	$3\frac{1}{3} \times 4\frac{1}{5} =$	$2\frac{1}{4} \times 1\frac{1}{3} =$	$4\frac{1}{6} \times \frac{3}{5} =$
	4.	$3\frac{6}{7} \times 9\frac{1}{3} =$	$7\frac{1}{2} \times 4\frac{2}{3} =$	$7\frac{1}{5} \times \frac{2}{3} =$	$3\frac{7}{9} \times \frac{5}{8} =$

Multiplication of Measures

217 Multiply in the two ways explained on page 217.

1. 3 hr. 15 min. 4	5. 4 lb. 8 oz. 7	9. 4 yd. 2 ft. 4
2. 5 hr. 30 min. 5	6. 3 lb. 4 oz. 5	10. 3 qt. 1 pt. 3
3. 6 min. 45 sec. 6	7. 5 ft. 8 in. 4	11. 5 lb. 12 oz. 6
4. 2 ft. 3 in. 4	8. 6 lb. 5 oz. 5	12. 3 gal. 2 qt. 3

Multiplication of Fractions

Use either of the two methods explained on page 219.

		a	b	c	d
I	1.	$3\frac{3}{4} \times 18 =$	$3\frac{3}{8} \times 48 =$	$9\frac{3}{4} \times 17 =$	$4\frac{2}{3} \times 15 =$
	2.	$15 \times 2\frac{3}{5} =$	$14 \times 3\frac{3}{4} =$	$10 \times 4\frac{2}{3} =$	$16 \times 3\frac{3}{4} =$
	3.	$9\frac{2}{3} \times 20 =$	$16 \times 7\frac{2}{3} =$	$7\frac{3}{4} \times 19 =$	$21 \times 3\frac{4}{5} =$
	4.	$6\frac{3}{4}$ 5	9 $4\frac{3}{8}$	16 $6\frac{5}{8}$	$8\frac{4}{5}$ 9

219

I	1.	$\frac{1}{2} \times 6 =$	$\frac{1}{4} \times 1\frac{1}{2} =$	$\frac{1}{4} \times \frac{1}{2} =$	$1\frac{2}{3} \times \frac{4}{5} =$
	2.	$5\frac{1}{2} \times 1\frac{7}{9} =$	$1\frac{1}{8} \times 1\frac{1}{3} =$	$6\frac{1}{4} \times 2\frac{2}{5} =$	$3 \times \frac{1}{2} =$
	3.	$5\frac{2}{3} \times 9 =$	$\frac{9}{10} \times \frac{1}{16} =$	$\frac{3}{4}$ of $18 =$	$\frac{3}{4} \times 5\frac{1}{2} =$
	4.	$6\frac{3}{5}$ 10	9 $2\frac{1}{2}$	404 $3\frac{3}{4}$	$12\frac{1}{3}$ 8
	5.	$2\frac{1}{2} \times \frac{2}{3} =$	$2 \times \frac{1}{3} =$	$\frac{1}{4} \times \frac{1}{6} =$	$3\frac{1}{4} \times \frac{1}{2} =$
	6.	$\frac{3}{4}$ of $20 =$	$\frac{1}{4} \times 2\frac{2}{5} =$	$\frac{1}{8}$ of $6 =$	$\frac{5}{6}$ of $3 =$
	7.	$2\frac{1}{2} \times \frac{3}{5} =$	$7 \times 4\frac{3}{4} =$	$\frac{1}{4} \times 3\frac{1}{3} =$	$6 \times \frac{9}{10} =$
	8.	$8\frac{1}{2} \times 4\frac{2}{5} =$	$3 \times 4\frac{1}{2} =$	$\frac{3}{4} \times 1\frac{1}{7} =$	$6\frac{1}{4} \times 4\frac{4}{5} =$

221

Mixed Practice

1.	$\frac{3}{4} + \frac{7}{8} =$	$\frac{2}{3} + \frac{3}{4} =$	$\frac{5}{6} + \frac{5}{6} =$	$\frac{3}{8} + \frac{1}{6} =$
2.	$7 - \frac{1}{2} =$	$\frac{2}{3} - \frac{1}{4} =$	$\frac{5}{6} - \frac{2}{3} =$	$\frac{7}{10} - \frac{2}{100} =$
3.	$6\frac{1}{2} + 7\frac{7}{8} =$	$9\frac{1}{2} + 4\frac{3}{4} =$	$9\frac{1}{4} - 6\frac{5}{6} =$	$8 \times 1\frac{2}{3} =$
4.	$5\frac{1}{3} \times 1\frac{1}{8} =$	$9\frac{5}{6} + 7\frac{3}{8} =$	$6 \times 1\frac{1}{8} =$	$8\frac{1}{8} - 7\frac{5}{6} =$

231

Division of Fractions

		a	b	c	d
I	1.	$3 \div \frac{1}{2} =$	$1 \div \frac{2}{3} =$	$3 \div \frac{1}{8} =$	$2 \div \frac{1}{3} =$
235	2.	$4 \div \frac{3}{8} =$	$4 \div \frac{2}{3} =$	$6 \div \frac{3}{4} =$	$2 \div \frac{5}{8} =$
	3.	$4 \div \frac{2}{3} =$	$3 \div \frac{7}{8} =$	$5 \div \frac{3}{5} =$	$4 \div \frac{1}{10} =$
	4.	$1 \div \frac{1}{2} =$	$1 \div \frac{3}{4} =$	$9 \div \frac{5}{10} =$	$1 \div \frac{1}{8} =$
	5.	$4 \div \frac{5}{6} =$	$8 \div \frac{6}{7} =$	$12 \div \frac{1}{4} =$	$16 \div \frac{1}{6} =$

Check by multiplication:

II	1.	$20 \div 3\frac{1}{3} =$	$10 \div 1\frac{1}{4} =$	$16 \div 1\frac{3}{5} =$	$6 \div 1\frac{1}{5} =$
236	2.	$8 \div 3\frac{1}{3} =$	$8 \div 2\frac{2}{3} =$	$12 \div 2\frac{4}{5} =$	$10 \div 3\frac{3}{4} =$
	3.	$5 \div 6\frac{2}{3} =$	$2 \div 4\frac{1}{4} =$	$1 \div 1\frac{1}{2} =$	$2 \div 5\frac{1}{2} =$
	4.	$7 \div 3\frac{3}{4} =$	$4 \div 5\frac{1}{3} =$	$6 \div 7\frac{1}{2} =$	$1 \div 1\frac{1}{4} =$
	5.	$9 \div 4\frac{1}{2} =$	$2 \div 6\frac{2}{3} =$	$4 \div 6\frac{2}{5} =$	$5 \div 3\frac{3}{4} =$
III	1.	$\frac{1}{2} \div \frac{1}{8} =$	$\frac{3}{4} \div \frac{1}{4} =$	$\frac{4}{5} \div \frac{2}{5} =$	$\frac{3}{5} \div \frac{2}{5} =$
237	2.	$\frac{1}{8} \div \frac{1}{4} =$	$\frac{1}{3} \div \frac{1}{2} =$	$\frac{1}{6} \div \frac{1}{2} =$	$\frac{3}{4} \div \frac{1}{3} =$
	3.	$5 \div 1\frac{1}{4} =$	$2 \div 3\frac{1}{3} =$	$\frac{3}{4} \div \frac{1}{2} =$	$6 \div 7\frac{1}{2} =$
	4.	$\frac{1}{8} \div \frac{3}{8} =$	$\frac{4}{9} \div \frac{2}{3} =$	$\frac{5}{8} \div \frac{5}{6} =$	$\frac{3}{4} \div \frac{4}{5} =$

Mixed Practice

IV	1.	$\frac{4}{5} + \frac{3}{8} =$	$\frac{3}{4} \times \frac{4}{5} =$	$3 \div 4\frac{1}{2} =$	$\frac{7}{8} - \frac{5}{6} =$
237	2.	$\frac{3}{4} \div \frac{3}{4} =$	$7 \div 1\frac{1}{2} =$	$8 \div \frac{2}{3} =$	$\frac{1}{2} \div \frac{1}{2} =$
	3.	$7 \div \frac{3}{4} =$	$5 \div 6\frac{2}{3} =$	$6 \div 4\frac{1}{2} =$	$12 \div 1\frac{1}{2} =$
	4.	$\frac{3}{4} + \frac{5}{6} =$	$\frac{3}{4}$ of $21 =$	$4\frac{1}{2} \times 1\frac{1}{5} =$	$8 \div 2\frac{2}{5} =$
	5.	$\frac{1}{2} \div \frac{7}{8} =$	$4 \div 9\frac{1}{3} =$	$5 \times 3\frac{5}{6} =$	$\frac{3}{4} \div \frac{7}{8} =$
	6.	$4 \div \frac{1}{5} =$	$\frac{1}{2} \div \frac{3}{8} =$	$6 \div \frac{1}{2} =$	$\frac{1}{4} \div \frac{3}{4} =$

Division of Fractions

Divide. Check your answers by multiplication.

		a	b	c	d	
I	1.	$3\frac{1}{2} \div \frac{1}{2} =$	$4\frac{1}{4} \div \frac{1}{4} =$	$3\frac{5}{6} \div \frac{1}{6} =$	$4\frac{1}{2} \div \frac{1}{2} =$	239
	2.	$1\frac{1}{4} \div \frac{1}{2} =$	$3\frac{1}{2} \div \frac{3}{4} =$	$1\frac{1}{2} \div \frac{1}{2} =$	$3\frac{3}{4} \div \frac{3}{8} =$	
	3.	$\frac{1}{2} \div \frac{1}{4} =$	$5\frac{1}{2} \div \frac{2}{3} =$	$1\frac{1}{4} \div \frac{3}{4} =$	$4 \div 1\frac{1}{2} =$	
	4.	$6\frac{7}{8} \div \frac{5}{8} =$	$6 \div 7\frac{3}{8} =$	$\frac{3}{4} \div \frac{3}{4} =$	$3\frac{1}{10} \div \frac{3}{10} =$	
II	1.	$4\frac{1}{2} \div 1\frac{1}{2} =$	$4\frac{1}{6} \div 2\frac{1}{2} =$	$6\frac{2}{3} \div 1\frac{1}{3} =$	$2\frac{1}{2} \div 1\frac{1}{4} =$	239
	2.	$1\frac{1}{2} \div 7\frac{1}{2} =$	$2\frac{1}{2} \div 3\frac{2}{3} =$	$3\frac{1}{4} \div 4\frac{2}{3} =$	$7\frac{1}{2} \div 12\frac{1}{2} =$	
	3.	$4\frac{1}{2} \div \frac{1}{4} =$	$7\frac{1}{2} \div 1\frac{3}{4} =$	$6 \div \frac{1}{2} =$	$\frac{3}{4} \div \frac{4}{5} =$	
	4.	$9 \div 4\frac{1}{2} =$	$3\frac{1}{4} \div 3\frac{1}{4} =$	$7\frac{1}{8} \div 2\frac{3}{8} =$	$1\frac{1}{4} \div \frac{1}{2} =$	

Divide. Then check your answers by multiplication.

III	1.	$\frac{1}{2} \div 1\frac{2}{3} =$	$\frac{3}{4} \div 1\frac{1}{2} =$	$\frac{7}{8} \div 2\frac{1}{3} =$	$\frac{3}{10} \div 1\frac{2}{10} =$	241
	2.	$\frac{3}{4} \div 4\frac{1}{2} =$	$\frac{7}{8} \div 1\frac{1}{6} =$	$\frac{5}{6} \div 4\frac{3}{4} =$	$\frac{7}{10} \div 2\frac{1}{10} =$	
	3.	$2\frac{1}{2} \div 7\frac{1}{2} =$	$\frac{5}{6} \div 2\frac{3}{8} =$	$\frac{1}{2} \div 4\frac{1}{3} =$	$4\frac{1}{2} \div 7\frac{1}{2} =$	
	4.	$\frac{5}{8} \div \frac{3}{8} =$	$\frac{7}{8} \div 1\frac{1}{8} =$	$2\frac{1}{5} \div 3\frac{1}{5} =$	$6\frac{1}{4} \div 2\frac{1}{2} =$	
	5.	$\frac{3}{4} \div 1\frac{1}{3} =$	$3 \div \frac{2}{3} =$	$\frac{1}{2} \div \frac{1}{4} =$	$7 \div 4\frac{1}{2} =$	

Mixed Practice

V	1.	$2\frac{1}{2} \div 12\frac{1}{2} =$	$7\frac{3}{4} + 6\frac{2}{3} =$	$9\frac{5}{6} - 3\frac{7}{8} =$	$\frac{7}{8} \div \frac{3}{4} =$	239
	2.	$1\frac{1}{8} \div \frac{1}{8} =$	$3\frac{1}{3} \div 1\frac{2}{3} =$	$1\frac{2}{3} \div 3\frac{1}{3} =$	$4\frac{1}{4} \div \frac{1}{2} =$	
	3.	$6 \times 2\frac{2}{3} =$	$5\frac{1}{2} \div 1\frac{3}{8} =$	$3\frac{1}{2} \div \frac{7}{10} =$	$5\frac{1}{2} \times 3\frac{1}{4} =$	
	4.	$4\frac{1}{6} \div \frac{5}{6} =$	$4 \div 1\frac{1}{3} =$	$2 \div 2\frac{1}{2} =$	$\frac{2}{3} \div \frac{5}{6} =$	
	5.	$\frac{1}{2} \times \frac{4}{5} =$	$6\frac{7}{8} \div \frac{5}{8} =$	$9\frac{1}{3} \div \frac{5}{6} =$	$\frac{3}{4} \div \frac{9}{10} =$	

Division of Fractions

Mixed Practice

	a	b	c	d
243 1.	$\frac{3}{4} \div \frac{1}{2} =$	$\frac{1}{3} \div \frac{1}{6} =$	$\frac{2}{3} \div \frac{1}{2} =$	$\frac{1}{4} \div \frac{1}{4} =$
2.	$4 \div 2\frac{1}{2} =$	$\frac{5}{6} \div \frac{1}{3} =$	$\frac{9}{10} \div \frac{3}{10} =$	$4 \div 5\frac{1}{3} =$
3.	$2\frac{3}{4} \div \frac{2}{3} =$	$\frac{5}{8} \div 4\frac{1}{2} =$	$1\frac{1}{2} \div \frac{3}{4} =$	$3\frac{1}{3} \div 6\frac{2}{3} =$
4.	$\frac{3}{8} \div 1\frac{3}{5} =$	$7\frac{1}{3} \div 1\frac{5}{6} =$	$\frac{2}{3} \div 6\frac{3}{4} =$	$1\frac{1}{4} \div \frac{1}{4} =$
5.	$7\frac{3}{4} + 8\frac{5}{6} =$	$6\frac{1}{3} - 2\frac{5}{8} =$	$\frac{3}{5}$ of $80 =$	$4\frac{1}{2} \times 3\frac{1}{4} =$

Divide. Then check by multiplication.

I 246 1.	$\frac{1}{2} \div 4 =$	$\frac{1}{4} \div 2 =$	$\frac{1}{2} \div 3 =$	$\frac{1}{8} \div 2 =$
2.	$\frac{3}{4} \div 2 =$	$\frac{3}{4} \div 6 =$	$\frac{2}{3} \div 2 =$	$\frac{2}{3} \div 5 =$
3.	$\frac{4}{5} \div 4 =$	$\frac{3}{4} \div 5 =$	$\frac{5}{6} \div 3 =$	$\frac{5}{6} \div 2 =$
4.	$\frac{3}{5} \div 3 =$	$\frac{4}{5} \div 4 =$	$\frac{3}{4} \div 8 =$	$\frac{7}{8} \div 4 =$
5.	$6 \div 1\frac{1}{2} =$	$4 \div \frac{3}{4} =$	$\frac{1}{2} \div \frac{3}{5} =$	$1\frac{1}{8} \div 3\frac{1}{4} =$
II 248 1.	$6\frac{1}{2} \div 2 =$	$2\frac{1}{2} \div 2 =$	$7\frac{2}{3} \div 5 =$	$7\frac{1}{2} \div 3 =$
2.	$1\frac{1}{4} \div 5 =$	$3\frac{1}{2} \div 7 =$	$3\frac{3}{4} \div 5 =$	$3\frac{3}{4} \div 6 =$
3.	$8\frac{1}{4} \div 6 =$	$1\frac{1}{4} \div 5 =$	$7\frac{2}{3} \div 5 =$	$1\frac{1}{5} \div 8 =$
4.	$\frac{1}{2} \div 5 =$	$2\frac{1}{2} \div 2 =$	$\frac{5}{6} \div 4 =$	$1\frac{3}{4} \div 6 =$

Mixed Practice

III 248 1.	$\frac{3}{4} \div \frac{9}{10} =$	$\frac{3}{4} \div 9 =$	$\frac{7}{10} \div \frac{3}{10} =$	$\frac{9}{10} \div 5 =$
2.	$4 \div \frac{3}{4} =$	$7\frac{1}{3} \div 6 =$	$1 \div \frac{1}{2} =$	$6 \div 5\frac{1}{4} =$
3.	$2 \div 3\frac{1}{2} =$	$\frac{3}{4} \div 3 =$	$3 \div 6\frac{3}{5} =$	$\frac{7}{8} \div 8 =$
4.	$7\frac{1}{3} + 6\frac{3}{4} =$	$9\frac{1}{2} - 3\frac{7}{8} =$	$4\frac{1}{2} \times 2\frac{1}{2} =$	$\frac{5}{6}$ of $72 =$
5.	$3\frac{1}{2} \div 6 =$	$5\frac{1}{2} \div 1\frac{3}{8} =$	$6\frac{1}{8} \div \frac{7}{8} =$	$4\frac{2}{3} \div 6\frac{1}{3} =$
6.	$6\frac{1}{2} \div 4 =$	$5\frac{3}{4} \div \frac{1}{2} =$	$2\frac{1}{4} \div 3 =$	$4\frac{1}{2} \div 6 =$

Division of Fractions

Divide. Check by multiplication.

	a	b	c	d	e	
1.	$3 \div \frac{1}{4} =$	$\frac{1}{2} \div \frac{1}{4} =$	$1\frac{1}{2} \div \frac{1}{2} =$	$3\frac{1}{2} \div 1\frac{1}{2} =$	$\frac{1}{3} \div \frac{1}{6} =$	253
2.	$\frac{5}{6} \div \frac{2}{3} =$	$1\frac{1}{2} \div 6 =$	$\frac{7}{8} \div \frac{4}{5} =$	$1\frac{7}{8} \div \frac{3}{8} =$	$6 \div \frac{3}{4} =$	
3.	$7\frac{1}{2} \div 5 =$	$8 \div \frac{5}{6} =$	$5\frac{1}{4} \div 3\frac{1}{2} =$	$8\frac{2}{3} \div 6 =$	$1\frac{1}{4} \div 7\frac{1}{2} =$	
4.	$4\frac{5}{6} \div \frac{2}{3} =$	$7\frac{1}{10} \div 8 =$	$\frac{5}{6} \div 8 =$	$\frac{3}{8} \div \frac{3}{8} =$	$\frac{7}{10} \div \frac{7}{10} =$	

Working Three Kinds of Fraction Problems

I	1. $\frac{1}{3}$ of 12 =	6 = ? of 12	3 = $\frac{1}{2}$ of ?	7 = $\frac{1}{3}$ of ?	8 = $\frac{1}{4}$ of ?	254
	2. $\frac{1}{4}$ of 17 =	8 = ? of 20	4 = $\frac{1}{3}$ of ?	6 = $\frac{1}{2}$ of ?	3 = $\frac{1}{4}$ of ?	
	3. 9 = ? of 27	18 = $\frac{1}{2}$ of ?	3 = $\frac{1}{6}$ of ?	18 = ? of 27	12 = ? of 36	
	4. $\frac{3}{4}$ of 22 =	12 = $\frac{1}{4}$ of ?	9 = ? of 18	40 = ? of 60	16 = $\frac{1}{3}$ of ?	
	5. 8 = $\frac{2}{3}$ of ?	6 = $\frac{3}{4}$ of ?	14 = $\frac{2}{3}$ of ?	15 = $\frac{5}{6}$ of ?	12 = $\frac{3}{4}$ of ?	
II	1. $\frac{3}{4}$ of ? = 9	$\frac{2}{3}$ of ? = 18	$\frac{2}{5}$ of ? = 16	$\frac{5}{6}$ of ? = 25	$\frac{7}{8}$ of ? = 21	255
	2. 35 = $\frac{5}{8}$ of ?	36¢ = $\frac{2}{3}$ of ?	40 = $\frac{5}{8}$ of ?	$\frac{3}{8}$ of ? = 12	$\frac{9}{10}$ of ? = 81	
	3. 16 = $\frac{2}{5}$ of ?	44 = $\frac{4}{9}$ of ?	27 = $\frac{3}{4}$ of ?	$\frac{2}{3}$ of ? = 40	$\frac{4}{5}$ of ? = 16	
III	1. $\frac{1}{2}$ of 16 =	6 = ? of 18	$\frac{3}{4}$ of 26 =	4 = ? of 6	$\frac{7}{8}$ of 16 =	255
	2. 6 = ? of 8	4 = $\frac{1}{4}$ of ?	8 = ? of 32	9 = $\frac{3}{5}$ of ?	12 = $\frac{3}{4}$ of ?	
	3. $\frac{2}{3}$ of ? = 4	$\frac{4}{5}$ of 25 =	$\frac{3}{4}$ = $\frac{1}{2}$ of ?	$\frac{3}{8}$ of 64 =	$\frac{4}{5}$ of ? = 48	
	4. 3 = $\frac{1}{5}$ of ?	15 = $\frac{3}{8}$ of ?	24 = ? of 32	25 = $\frac{5}{6}$ of ?	72 = $\frac{8}{9}$ of ?	
	5. 56 = $\frac{7}{8}$ of ?	$\frac{5}{8}$ = $\frac{1}{5}$ of ?	7 = $\frac{1}{4}$ of ?	16 = $\frac{4}{7}$ of ?	16 = ? of 24	

Division of Fractions (Continued)

I 258 Tell which quotients will be greater than 1. Divide and check.

	a	b	c	d	e
1.	$1\frac{1}{2} \div \frac{1}{4}$	$2\frac{1}{4} \div 2\frac{1}{4}$	$3\frac{1}{2} \div \frac{2}{3}$	$2 \div \frac{3}{4}$	$3\frac{1}{2} \div 7$
2.	$\frac{1}{2} \div \frac{1}{4}$	$\frac{2}{3} \div 6$	$\frac{3}{4} \div \frac{7}{8}$	$3\frac{1}{2} \div 4$	$4\frac{1}{2} \div \frac{1}{2}$
3.	$1\frac{1}{3} \div 4$	$6\frac{3}{4} \div \frac{3}{4}$	$\frac{3}{4} \div \frac{1}{2}$	$\frac{4}{5} \div 2$	$7\frac{1}{2} \div 2\frac{1}{2}$
4.	$\frac{2}{3} \div \frac{5}{6}$	$1\frac{1}{2} \div 7\frac{1}{2}$	$9\frac{3}{5} \div 6$	$1 \div \frac{1}{5}$	$6\frac{2}{5} \div 4$

II 258 Multiply. Check by division.

1.	$4 \times \frac{3}{4}$	$\frac{1}{2} \times 5$	$\frac{1}{2} \times \frac{3}{4}$	$\frac{1}{2} \times \frac{5}{6}$	$\frac{1}{2} \times 2\frac{1}{4}$
2.	$3\frac{1}{2} \times 5$	$3 \times 2\frac{1}{2}$	$7\frac{3}{4} \times 8$	$6\frac{1}{4} \times 7$	$5 \times 3\frac{3}{4}$
3.	$3\frac{1}{4} \times \frac{2}{3}$	$\frac{7}{8} \times 5\frac{3}{5}$	$6\frac{1}{2} \times 2\frac{1}{4}$	$3\frac{1}{3} \times 1\frac{1}{5}$	$\frac{2}{3} \times 3\frac{3}{7}$

Dividing Measures

Divide, using the two methods explained on page 259.

259

1. 6 ft. 5 in. ÷ 3 =
2. 6 lb. 8 oz. ÷ 4 =
3. 3 lb. 12 oz. ÷ 3 =
4. 3 hr. 30 min. ÷ 2 =
5. 7 yd. 2 ft. ÷ 4 =
6. 5 gal. 3 qt. ÷ 6 =
7. 4 bu. 2 pk. ÷ 3 =
8. 5 bu. 3 pk. ÷ 2 =

Mixed Practice with Measures

259

	a	b	c	d
1.	2 ft. 6 in. +4 ft. 9 in.	9 ft. 4 in. −3 ft. 7 in.	6 yd. 2 ft. +4 yd. $1\frac{1}{2}$ ft.	3 gal. 1 qt. −1 gal. 3 qt.
2.	8 hr. 15 min. +7 hr. 50 min.	8 min. $6\frac{1}{2}$ sec. −3 min. $9\frac{1}{4}$ sec.	3 lb. 9 oz. +1 lb. 8 oz.	6 lb. 5 oz. −2 lb. $8\frac{1}{2}$ oz.
3.	$3\overline{)7\text{ yd. }1\frac{1}{2}\text{ ft.}}$	$4\overline{)9\text{ hr. }15\text{ min.}}$	3 gal. $1\frac{1}{2}$ qt. ×4	5 lb. 6 oz. ×6

Multiplication of Decimals

		a	b	c	d	e	f	g	
I	1.	.3 3 .9	.6 3 1.8	.4 2 .8	.8 5 4.0	.2 3 .6	.7 7 4.9	.6 4 2.4	274
	2.	1.1 2 2.2	4.2 3	8.3 4	5.3 9	8.6 8	14.8 7	27.9 9	
	3.	64.1 9	.1 4	7.5 8	39.7 5	.5 7	89.7 6	.9 8	
II	1.	6.3 8	5.94 9	12.6 9	5.17 8	.271 9	9.49 8	.38 7	276
	2.	7.309 92	1.06 7	4.85 29	1.268 83	4.7 47	.26 6	3.85 38	
	3.	.9 5	2.74 38	.714 65	5.29 74	1.835 56	3.2 4	36.8 19	

Multiplying by Four-Place Numbers

III 277

1. 1375 × 3815
2. 7000 × 9758
3. 6482 × 5197
4. 5700 × 6405
5. 8000 × 7924
6. 8642 × 2478
7. 8006 × 4795
8. 5037 × 2147
9. 8504 × 6857
10. 7050 × 3209
11. 6080 × $57.98
12. 7153 × $32.69
13. 4286 × $96.83
14. 7005 × $50.46
15. 8600 × $36.82

Multiplying Decimals by 10, 100, and 1000

V 278

1. 10 × 3.6
2. 10 × 7.54
3. 10 × 27.1
4. 10 × 6.758
5. 100 × .36
6. 100 × 3.4
7. 100 × 2.76
8. 100 × 9.847
9. 1000 × 3.642
10. 1000 × .047
11. 1000 × 5.96
12. 10 × .8
13. 100 × .25
14. 100 × 3.6
15. 1000 × 8.1

Multiplying with Decimal Fractions

		a	b	c	d	e	f
I (282)	1.	4.3 7	71.9 .9	.24 .8	5.82 .9	29 .6	24.6 .9
	2.	57 .5	5.7 .6	5.8 7.3	.814 96	65.4 .49	.69 2.7
	3.	8.26 5.7	87.3 9.1	.68 8.2	9.43 7.5	.846 60	2.35 1.8
	4.	1.986 9	8.27 7.4	.368 24	87.9 .38	3.97 2.5	51.6 80
II (283)	1.	.3 .2	.4 .2	.04 .6	.12 .6	.02 .4	.14 .5
	2.	.01 .6	.2 .2	.05 .7	.06 .8	.03 .4	.006 7
	3.	.5 .01	.015 5	.005 9	12 .004	.8 .12	.05 .1

Mixed Practice

III (282)	1.	3.6 +4.5	.5 +.7	7.86 +3.95	.26 +.54	8.176 +3.592	.358 +.469
	2.	9.3 −2.6	.9 −.5	.36 −.18	5.74 −2.38	.436 −.259	7.684 −5.386
	3.	64 ×.9	.47 ×2	.92 ×5	26.49 ×6	3.8 ×.6	6.847 ×7

Multiplication of Decimals

	a	b	c	d	
1.	$6 \times .1 =$	$2 \times .03 =$	$6 \times .003 =$	$7 \times .6 =$	285
2.	$5 \times 3.7 =$	$8 \times 3.79 =$	$.7 \times 56 =$	$.9 \times 85 =$	
3.	$.6 \times 1.4 =$	$.3 \times .85 =$	$.24 \times 87 =$	$9.8 \times 3.67 =$	
4.	$10 \times .7 =$	$100 \times .7 =$	$1000 \times .7 =$	$100 \times 8.6 =$	
5.	$6.8 \times 7.9 =$	$.96 \times .87 =$	$3.42 \times 18.9 =$	$59.6 \times 6.78 =$	

Mixed Practice

	a	b	c	d	e	
1.	$3\frac{3}{4}$ $+1\frac{7}{8}$	7.157 $+6.826$	$8\frac{1}{2}$ $-2\frac{2}{3}$	$.046$ $+.098$	$6\frac{7}{8}$ $+3\frac{4}{5}$	285
2.	36.0 -1.7	$26\frac{1}{2}$ $\times 8$	1.6 $-.8$	7 $-5\frac{1}{2}$	$16\frac{2}{3}$ $\times 7$	
3.	2.8 $\times .4$	$6\frac{3}{8}$ $+4\frac{5}{6}$	37.8 $\times 5.9$	$.57$ $\times 6$	48.9 $\times .28$	
4.	$.378$ $\times 6$	25.76 -14.94	48 $\times 7\frac{2}{3}$	1.853 $\times 100$	$9\frac{2}{3}$ $-6\frac{3}{4}$	

1.	3.6 $+2.3$	$7\frac{1}{2}$ $-2\frac{3}{4}$	8.75 $+2.46$	$6\frac{1}{2} \div 3\frac{1}{4} =$	$8\frac{1}{2}$ $\times 7$	285
2.	$3\frac{1}{2} \times 2\frac{2}{3} =$	$.4$ $\times .2$	$2\frac{1}{4} \div 3 =$	$6\frac{2}{3} + 7\frac{5}{8} =$	$.6$ $+.3$	
3.	9 $\times 5\frac{3}{4}$	57.62 -1.49	589 $\times .24$	389 $\times .106$	76.4 $\times 9.48$	

4. 6 hr. $7\frac{1}{2}$ min.
$-$2 hr. 45 min.

5. 6 ft. $4\frac{1}{2}$ in.
$-$2 ft. $7\frac{3}{4}$ in.

6. 3 lb. $2\frac{1}{2}$ oz.
$\times 4$

Division with Decimal Fractions

I

296

	a	b	c	d	e
1.	6)18.6	5)3.5	4)31.2	3).9	2)7.0
2.	3)16.8	7)52.5	9)68.4	3)1.2	4)2.8
3.	5)67.5	2).6	8)48.2	5)27.5	6)639.6

II

297

	a	b	c	d	e
1.	3)6.21	4)167.28	4)13.64	5)8.75	8)68.08
2.	4)3.944	9)87.39	6)4.878	2)3.716	6)5.718
3.	45)95.85	36)308.16	28)148.4	12)1.596	25)9.175

III Express the remainders as fractions and as decimals.

300

	a	b	c	d	e
1.	2)7	5)9	8)12	15)42	2)15
2.	4)17	8)46	12)45	6)20	9)24

IV Round off the quotients to the nearest hundredth.

303

	a	b	c	d	e
1.	12)38	9)40	15)35	7)29.3	19)64.28
2.	30)55	6)47	49)86.7	97)90.42	83)24.584
3.	64)246	24)160	50)12.75	48)8.239	12)400

V Do not carry the work to more than three places.

303

	a	b	c	d	e
1.	4)3.0	6)1.5	8)4.36	5)36.427	9)8.4
2.	16)83.97	6)9.855	25)21.4	56)93	39)326.3
3.	15)11.1	62)384	11)14.4	3).853	80)650

Division with Decimals

		a	b	c	d	e	
I	1.	$.7\overline{)42}$	$.4\overline{)13}$	$.8\overline{)5}$	$.9\overline{)27}$	$.5\overline{)23}$	307
	2.	$1.1\overline{)66}$	$1.2\overline{)26}$	$1.5\overline{)6}$	$2.5\overline{)60}$	$3.3\overline{)99}$	
	3.	$7.5\overline{)225}$	$3.2\overline{)384}$	$4.8\overline{)12}$	$6.4\overline{)136}$	$9.4\overline{)658}$	
II	1.	$.04\overline{)2}$	$.08\overline{)16}$	$.05\overline{)30}$	$.07\overline{)77}$	$.09\overline{)81}$	308
	2.	$.15\overline{)45}$	$.24\overline{)72}$	$.84\overline{)63}$	$.56\overline{)21}$	$.14\overline{)80}$	
	3.	$.04\overline{)1}$	$.05\overline{)7}$	$.25\overline{)2}$	$.48\overline{)16}$	$.54\overline{)90}$	
III	1.	$.2\overline{).4}$	$.4\overline{)1.6}$	$.2\overline{)1.6}$	$.6\overline{).3}$	$.5\overline{)3.75}$	310
	2.	$.04\overline{)1.64}$	$.08\overline{)9.68}$	$.12\overline{)1.56}$	$.08\overline{)3.6}$	$.02\overline{).06}$	
	3.	$.3\overline{)3.15}$	$.24\overline{)9.84}$	$1.6\overline{)4.832}$	$5.6\overline{)11.856}$	$.24\overline{)9.864}$	

Divide. Round off the quotient to the nearest tenth.

IV	1.	$1.8\overline{)2.65}$	$.84\overline{)15.4}$	$2.5\overline{)16}$	$.34\overline{)16.4}$	$2.7\overline{)8.43}$	310
	2.	$13\overline{)101}$	$.59\overline{)17.4}$	$.06\overline{)28.5}$	$7.9\overline{)103.46}$	$.94\overline{)111.3}$	
	3.	$5.6\overline{)40.4}$	$73\overline{)150}$	$1.9\overline{)84.7}$	$.48\overline{)32.6}$	$.83\overline{)56}$	
V	1.	$4\overline{).32}$	$5\overline{).005}$	$32\overline{)2.56}$	$4\overline{).036}$	$16\overline{).976}$	311
	2.	$24\overline{)1.44}$	$.8\overline{).048}$	$2.5\overline{).175}$	$56\overline{)1.4}$	$.6\overline{).048}$	
	3.	$6.5\overline{).195}$	$36\overline{)2}$	$.7\overline{).056}$	$32\overline{)1.632}$	$.9\overline{).06}$	

Division with Decimals

		a	b	c	d	e
I	1.	4)3.48	.08)6.48	.7).966	1.5)1.65	.9)8.91
312	2.	8.4)3.024	.11)17.6	2.1)4.83	.45)94.5	3.2)150.4
	3.	1.2)1.56	80)7.28	5.4).135	.06).138	.56)49
	4.	1.4).084	9.6)32	2.3)9.43	.48)1.536	.72)36
II	1.	2)7.6	4).8	5)5.75	8)9.632	2)5
312	2.	4)7	8)21	6)3	.2)16	.5)30
	3.	1.2)36	2.5)125	.12)48	.08)64	.14)7
	4.	.72)16	.9)7.2	1.1)1.54	.08)9.76	.15).675

Mixed Practice

		a	b	c	d	e
III	1.	38.6 +47.3	.049 +.027	96.47 +85.93	7.86 +.04	8.000 +1.596
312	2.	84.7 −25.6	.48 −.39	4.762 −3.984	124.5 −123.9	.052 −.047
	3.	43.7 ×4	.2 ×3	2.68 ×25	378 ×9.6	25.9 ×3.4
	4.	18 ×.4	4.73 ×8.2	.597 ×37	985 ×1.89	.674 ×100
	5.	3)5.7	4).96	5).375	8)96.7	4)5
	6.	.8)576	.12)6	1.1)3.08	.25)38.975	.16)9.6

Tables of Measures

Counting

12 things	= 1 dozen	20 things	= 1 score
12 dozen	= 1 gross	500 sheets	= 1 ream

Measures of Length

12 inches	= 1 foot	5,280 feet	= 1 mile
3 feet	= 1 yard	1,760 yards	= 1 mile
$16\frac{1}{2}$ feet or $5\frac{1}{2}$ yards	= 1 rod	320 rods	= 1 mile

Surface or Square Measures

144 square inches	= 1 square foot
9 square feet	= 1 square yard
$30\frac{1}{4}$ square yards	= 1 square rod
160 square rods or 43,560 square feet	= 1 acre
640 acres	= 1 square mile or 1 section
36 sections	= 1 township

Measures of Time

60 seconds	= 1 minute	7 days	= 1 week
60 minutes	= 1 hour	365 days	= 1 year
24 hours	= 1 day	366 days	= 1 leap year

Liquid Measures

2 cups	= 1 pint	4 quarts	= 1 gallon
2 pints	= 1 quart	$31\frac{1}{2}$ gallons	= 1 barrel

Dry Measures

2 pints	= 1 quart	4 pecks	= 1 bushel
8 quarts	= 1 peck		

Measures of Weight

16 ounces	= 1 pound
*60 pounds	= 1 bushel of wheat or potatoes
*56 pounds	= 1 bushel of corn or rye
100 pounds	= 1 hundredweight
20 hundredweight	= 1 ton
2,240 pounds	= 1 long ton

*In most states.

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